

**DO BASELINE MEASURES OF INDIVIDUAL AND FAMILY HEALTH
PREDICT ACTIVITY LEVELS IN AFRICAN AMERICANS?**

by

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Objectives: Increased physical activity is associated with decreased risk for several chronic diseases, including hypertension and diabetes. Although African Americans are at increased risk for these conditions, there is little knowledge about factors that influence physical activity in this population. We investigated whether physical activity could be predicted by baseline variables including: demographic, medical, anthropometric, fitness, stress and family health factors.

Methods: Of 1,879 participants (85% female, median age = 51) from the Healthy Black Family Project who completed a baseline fitness assessment and questionnaire over an 18-month period, 988 attended at least one exercise class (active group) and 891 never attended an exercise class (non-active group). Of all 1,879 participants, 98 individuals also completed a family history with a genetic counseling student three months before or after their initial assessment. Multiple linear regression, t-tests, and chi-squared analyses were conducted to test for effects on activity level and differences between groups.

Results: In the active group, the average number of exercise classes attended was 14. Analyses indicated that increased activity was significantly correlated with increased percent body fat ($p = 0.001$), decreased BMI ($p = 0.028$) and decreased flexibility ($p = 0.088$). In the top quartile of the active group, family history of diabetes ($p = 0.006$) and personal history of cardiovascular concerns ($p = 0.016$) predicted activity. These findings accounted for 2 and 5.3% of variation in activity, respectively. There were many significant findings between the non-active and active

groups, indicating that individuals in poorer health and at greater risk for disease tend to be more active. Individuals who completed a family history risk assessment were also more likely to be active.

Conclusions: Results indicate that baseline physical measurements as well as individual and family health variables are correlated with activity levels in African Americans. Dynamics of the Healthy Black Family Project likely contribute to at-risk individuals being more active.

Implications for Public Health: Community intervention programs targeting African Americans at high risk for chronic disease aim to reduce health disparities. Identifying factors that influence physical activity among this population will enable interventions to tailor services to encourage activity and reduce risk for disease.

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1.0 INTRODUCTION

This research was conducted through the Center for Minority Health (CMH) at the University of Pittsburgh's Graduate School of Public Health. The CMH was created in 1994 and Dr. Stephen B. Thomas has served as the director of the center since 2000. The mission of the CMH is to eliminate racial and ethnic health disparities, which is also one of two overarching goals set by the CDC's Healthy People 2010 campaign. Racial and ethnic health disparities can be defined as any "disproportionate burden of disease, injury, death, and/or disability" affecting racial and ethnic minorities (1). There is undeniable evidence that race and ethnicity are correlated with health disparities in the United States. In order to address these disparities, the CMH created a program aimed at reducing the prevalence of chronic diseases, including diabetes and hypertension, in the African American population. The Healthy Black Family Project (HBFP), modeled after the successful Diabetes Prevention Program, is housed at two sites in the east end of Pittsburgh: the Kingsley Center in East Liberty and Hosanna House in Wilkinsburg. The program sites are located in primarily African American neighborhoods and participants are offered nutrition, stress management, smoking cessation, and physical activity classes at no cost. A wide variety of physical activity classes are offered including: yoga, African dance, body toning, walking, and water aerobics. The goal of the HBFP is simple, to assist participants in improving their overall health thereby preventing the onset and/or reducing the severity of illness.

In order for participants to improve their health, an important first step is to understand the health conditions that they are at risk for based on their family history. The Family Health History Initiative was created to address this need. Several genetic counseling graduate students at the University of Pittsburgh work on this part of the project and invite participants to meet individually to discuss their family histories and have their pedigrees drawn out. The genetic counseling students provide personalized risk assessments to individuals and let them know if their family histories put them at average, moderate, or high risk for several chronic health conditions based on published data (2). Afterwards, participants are offered the opportunity to find out about and take part in research by signing up for the Minority Research Recruitment Database. Consenting participants are sent information about research studies when they meet the eligibility criteria developed for these studies.

Regular physical activity has been shown to reduce the risk for many common health conditions, including cardiovascular disease and type 2 diabetes. Ruth Dudley, a recent alumna of the Genetic Counseling Program, completed a research project that examined the effect of the family health history on physical activity (3). She found that members of the HBFP who had their family history done were more likely to increase their self-reported physical activity than those who did not meet with a genetic counseling student (3). In addition, many members have improved their health by attending the exercise classes offered through the HBFP. Yet, some participants tend to be quite active while others are less or non-active in available physical exercise classes. While research has been done to elucidate the determinants of physical activity, more research needs to be done to look for predictors of activity in community based interventions targeting the African American population. In addition, previous research efforts have focused primarily upon the psychological variables that determine physical activity,

information that is often not collected in community interventions. This research aims to determine whether physical activity level can be predicted by the baseline individual and family health variables which are inquired about at the start of most exercise programs. This work also aims to further explain the effect of having a family health history on physical activity level. Community intervention programs targeting African Americans at high risk for chronic disease aim to reduce health disparities. Identifying baseline factors that influence physical activity among this population will enable us to tailor services to encourage activity and reduce risk of chronic disease. The following literature review provides a basis for this research and includes information about racial and ethnic health disparities in the United States, the importance of the family health history, a review of community interventions targeting the health of African Americans, and evaluation of previous research into the factors influencing physical activity.

2.0 SPECIFIC AIMS

2.1 SPECIFIC AIM 1

Specific Aim 1: To determine if activity levels in African Americans can be predicted by baseline individual and family health variables including: demographic, medical, anthropometric, fitness, stress and family health factors.

Hypothesis: Previous research has found determinants that predict physical activity levels. Research of baseline characteristics that predict physical activity levels in the African American community is scarce. Based on available research, it was hypothesized that specific baseline individual and family health variables predict some of the variation in activity levels in this population.

Plan: All participants in the HBFP complete a baseline fitness assessment and questionnaire. Data for participants who completed a fitness assessment between July 1, 2005 and December 31, 2006 and attended at least one exercise class (n = 988) were analyzed. Stepwise multiple linear regression was conducted on all data to test for significant predictors of activity.

2.2 SPECIFIC AIM 2

Specific Aim 2: To characterize significant differences between participants with various activity levels including: non-active vs. active, non-active vs. top quartile active, and bottom quartile active vs. top quartile active groups.

Hypothesis: Of 1,879 participants who completed a baseline fitness assessment and questionnaire over an 18-month period, 988 attended at least one exercise class (active group) and 891 never attended an exercise class (non-active group). Previous research has delineated characteristics of individuals with various levels of activity and adherence to exercise programs. Research is scarce regarding characteristics of non-active individuals. Based on past research, it was hypothesized that there are significant differences between the non-active and active groups, the non-active and top quartile active groups, and the bottom quartile active and top quartile active groups.

Plan: Using the data from the baseline fitness assessment and questionnaire, t-tests and chi-square analyses were conducted to test for significant differences between the various groups.

2.3 SPECIFIC AIM 3

Specific Aim 3: To determine the effect of having a family health history risk assessment with a genetic counseling student on physical activity level in African Americans.

Hypothesis: Previous work has shown that individuals who complete a family health history with a genetic counseling student are more likely to increase their level of self-reported physical activity (3). Based on this research, we hypothesized that individuals who completed a family

history risk assessment and were told they were at moderate or high risk for cardiovascular disease, diabetes, and/or hypertension are more likely to be active than those who were told they were at average risk for these conditions. In addition, we hypothesized that there would be significant differences found between active and non-active individuals who completed a family history.

Plan: Of all participants who had a baseline fitness assessment and questionnaire done between July 1, 2005 and December 31, 2006 ($n = 1879$), 209 had their family health history drawn out with a genetic counseling student. We chose only to analyze the data from those who had their family history done 3 months before or 3 months after their initial fitness assessment ($n = 109$), since we felt beyond this time period it would be difficult to conclude that family history had a significant impact on their activity level. Of those 109 participants, only 98 had risk assessment information recorded in Progeny® and therefore data were only analyzed for these participants. Of the 98 participants, 66 attended at least one exercise class (active group) and 32 never attended an exercise class (non-active group). Chi-square analyses were done to test for significant effects between groups. Only risks for cardiovascular disease, hypertension, and diabetes were analyzed as increased physical activity is the recommendation given to reduce risk for these chronic conditions.

3.0 BACKGROUND AND SIGNIFICANCE

3.1 RACIAL AND ETHNIC HEALTH DISPARITIES IN THE US

As early as 1899, W.E.B. Dubois wrote about the health status of African Americans (4). In 1906, he published *The Health and Physique of the Negro American* where he used epidemiological methods to document the health disparities between African Americans and Caucasians (4). Up to that point, it was thought that African Americans suffered a higher mortality rate due to racial inferiority (4). Dubois discussed that these disparities were in reality due to African Americans having inferior economic, social, and sanitary conditions compared with Caucasians (5). Health disparities between African Americans and other racial groups continue to this day and as the population continues to expand, so does the problem. In July 2006, approximately 40.2 million people or 13.4% of the US civilian population identified themselves as Black or African American, making African Americans the second largest minority group in the US after the Hispanic/Latino population (6).

Disparities in overall morbidity and mortality rates are striking in the African American population. While some have attributed the discrepancy to differences in socioeconomic status (SES), when SES variables are controlled for, minorities continue to have poorer health status and die at a higher rate than Caucasians (7, 8). Overall, the death rate is 31% higher for African Americans than Caucasians and that number jumps to 35% when adjusting for age, sex, gender,

and number of potential life-years lost (9, 10). This ratio has remained consistent since 1997 (11). Besides a higher overall mortality rate, the average life expectancy is lower for African Americans than Caucasians, 73.1 years compared to 78.3 years respectively (11). African American males have the shortest life expectancy at 69.5 years compared to 75.7 years for Caucasian males (11). African American males also tended to die at a higher rate from all causes, 1269.4 (per 100,000) compared with Caucasian males, 939.6 (per 100,000) (9). While African American females have a higher life expectancy than Caucasian males at 76.3 years, this number is still lower than the 80.8 years Caucasian females are expected to live (11). African American females die at a higher rate from all causes of death, 855.3 (per 100,000) compared with Caucasian females, 666.9 (per 100,000) (9).

African Americans are also more likely to be obese. Obesity is a risk factor for many common chronic health conditions. For an individual to be classified as obese he or she must have a body mass index (BMI) of greater than or equal to 30 kg/m^2 , while those with a BMI of greater than or equal to 25 kg/m^2 are considered overweight (12). In 2001, according to the Behavioral Risk Factor Surveillance System (BRFSS) run by the CDC, African Americans were more likely to be classified as overweight (68.2%) and obese (32.4%) than any other racial or ethnic group (12). From 2001-2004, 66% of the US adult population aged 20-74 was classified as being overweight (9). While African American men are actually less likely to be overweight (66.8%) than Caucasian men (71.1%), African American women are much more likely to be categorized as overweight (79.5%) than Caucasian women (57.1%) and the general population (9). From 2001-2004, the national obesity rate was reported to be 32.1% (9). African American and Caucasian men had similar rates of obesity, 31.2 and 31.0% respectively. Again, African

American women, however, had a much higher rate of obesity (51.6%) compared with Caucasian women (31.5%) and the general population (9).

In 2004, the three leading causes of death in the United States were cardiovascular disease, cancer, and stroke. These were the same leading causes of death for both African Americans (diabetes ranked fourth) and Caucasians, but African Americans tended to have significant differences in mortality and life expectancy for these conditions when compared to Caucasians (9, 12, 13). The age-adjusted death rate for cardiovascular disease in the African American population exceeded the Caucasian rate by approximately 32%. Caucasian females were least likely to die from heart disease with a rate of 172.9 (per 100,000), while African American females died at a rate of 236.5 (per 100,000) (9). Caucasian males, on the other hand, had an age adjusted death rate of 264.6 (per 100,000) and African American males had the highest death rate from cardiovascular disease at 342.1 (per 100,000) (9).

Diabetes and hypertension, conditions that can lead to cardiovascular disease and other medical complications, are also more prevalent in the African American population. African Americans are two times more likely to be diagnosed with diabetes, 1.8 times more likely to be hospitalized from the disease, and 2.2 times more likely to die from the condition compared with Caucasians (6, 14). Additionally, in 2001, the BRFSS reported that African Americans were 1.5 times more likely to be told by a health care professional that they had hypertension than Caucasians (12).

Age adjusted death rates (per 100,000) from cancer also continue to be higher for African Americans than their Caucasian counterparts (1). Overall, African American men have the highest cancer mortality rate at 301.2 (per 100,000) compared with Caucasian men at 224.4 (per 100,000) (9). African American women have lower death rates from cancer than men at 182.5

(per 100,000), but higher mortality than Caucasian females, 157.0 (per 100,000) (9). Additionally, age adjusted incidences (per 100,000) of certain types of cancer continue to be higher for African Americans than Caucasians. One type of cancer that occurs noticeably more often in the African American population is colorectal cancer. Colorectal cancer rates continue to be higher for African American men at 70.9 cases (per 100,000) compared with white men who have a rate of 54.0 cases (per 100,000) (9). African American women have a higher rate of colorectal cancer with 51.6 cases (per 100,000) compared with Caucasian women with a rate of 39.7 cases (per 100,000). In addition, African American men continue to have a much higher rate of prostate cancer, 233.9 cases (per 100,000), compared with Caucasian men who are diagnosed at a rate of 155.5 cases (per 100,000) (9). Finally, while African American women are 10% less likely to be diagnosed with breast cancer, they are 36% more likely to die than their white counterparts (6).

National racial and ethnic health disparities are mirrored here in Allegheny County. According to the 2000 census report, approximately 12.4% of people who reside in Allegheny County identified themselves as Black or African American, which equates to about 160,000 residents (15). Life expectancies for African American men and women in Allegheny County are not significantly different from the state and national statistics. African American males still have the shortest lifespan as they are expected to live 5.7 years less than Caucasian males and 10.8 years less than Caucasian females. While African American females are expected to live 7.8 years longer than African American males, Caucasian females still have a longer life expectancy than African American females by 3.0 years (16). The rate of death from stroke is 1.5 times the rate for Caucasians in the African American population for those aged 65-74 (16). Among African American women aged 44-54 and African American men aged 35-44 in

Allegheny County, the death rate is three times higher for cardiovascular disease than the Caucasian rate (16). Similar to the national statistics, African Americans in Allegheny County are two times more likely to die from diabetes than Caucasians (16). Finally, deaths from prostate cancer occur three times as often in African American men aged 65-74 compared with Caucasian males in the same age group (16).

Many reasons have been cited for the health disparities between African Americans and Caucasians, including racial discrimination. (1, 14). One study reported that 80% of African Americans in the US have reported experiencing racial discrimination at some point in their lives (7). In addition, African Americans are disadvantaged in regards to SES. The US Census Bureau reported that 20% of African Americans live at or below the poverty level compared with only 8% of Caucasians (6). The unemployment rate for African Americans is twice that of their Caucasian counterparts (6). As stated earlier, SES alone cannot account for all racial and ethnic health disparities since even when income and other variables are controlled for, health disparities persist (13). Lack of access to health care is another reason cited for racial and ethnic health disparities. Many people have inadequate healthcare or no healthcare at all, making routine preventative care difficult to receive (8). Furthermore, findings suggest that African Americans who do have healthcare have less access to continuous care and poorer quality of medical attention. Lifestyle behaviors and social environment can also play a role in disparities. Those who are disadvantaged have greater exposure to risk factors for disease (1). In order to eliminate health disparities, culturally sensitive public health programs and equal access to health care for minorities is necessary (1).

3.2 IMPORTANCE OF THE FAMILY HEALTH HISTORY

As previously discussed, common chronic diseases are the leading causes of death in the US and African Americans are more likely to develop and die from these conditions than Caucasians. Common diseases are multifactorial, meaning they are caused by some combination of genetic and environmental factors, including both gene-gene and gene-environment interactions. Genes explain only a small portion of the total variation in most risk factors and diseases. The interaction between genes is complex and not completely understood. For multifactorial conditions, genetic susceptibility to disease is most often the result of many low penetrant genes interacting with environmental risk factors like smoking, diet, and physical activity to increase risk (17). Therefore, while common diseases can be prevalent in families, we cannot always identify those individuals at greatest risk for future disease through medical testing. Family history is an important risk factor that can help to identify at-risk individuals because it reflects inherited genetic susceptibility, shared environment, and common behaviors (17-19).

Family history has been identified as a risk factor for many common diseases of public health significance, including cardiovascular disease, several types of cancer (e.g. breast, ovary, colon, prostate), osteoporosis, and asthma (17). A study by Scheuner et al. (1997) looked at the incidence of cardiovascular disease, diabetes, and several types of cancer in families and found that 42.5% of individuals reported having a family history of at least one of these conditions (2). Individuals who have close relatives with these and other health conditions are more likely to develop the same conditions themselves (18). In fact, previous research has indicated that someone with a family history of a common disease is at two to five times greater risk for developing the disease than individuals without a family history. This risk can be greater

depending on the number of relatives affected and their ages at diagnosis, with early onset disease conferring the greatest risk (2).

Family history is an independent predictor of cardiovascular disease risk and may be a better predictor than extreme levels of other variables like blood pressure and cholesterol levels in high risk families (20). Numerous studies have examined the utility of the family history in estimating risk for cardiovascular disease. The Health Family Tree Study in Utah found that family history was more accurate in predicting risk when it accounted for age at diagnosis of family members with coronary heart disease (20). Unaffected family members were at the greatest risk to get the condition if they had a family history of early onset coronary heart disease (20). While only 14% of families in that study had a family history of coronary heart disease, they accounted for 72% of all early onset coronary heart disease and 48% of all coronary heart disease events (20). Cardiovascular disorders are common in families. In fact, coronary artery disease, stroke, and syndrome X (combination of health conditions that put someone at an increased risk for cardiovascular disease including: central obesity, glucose intolerance, high triglycerides, low HDL cholesterol, and high blood pressure) accounted for 79% of all positive family histories in a study by Scheuner et al. (2). Twenty-nine percent of participants in that study reported a family history of coronary artery disease specifically (2).

Many other common diseases can be seen clustering in families. For example, it is estimated that nearly 21 million people in the US have diabetes (95% have type 2 diabetes) and up to 1/3 of those individuals are undiagnosed (21). Scheuner et al. reported that 14% of individuals studied reported a family history of diabetes (2). A study by Valdez et al. (2007), aimed to see how family history risk compared with the prevalence of diabetes in the general population (21). Data was analyzed from 16,388 people who completed the National Health and

Nutrition Examination Survey from 1999 to 2004. Participants were deemed average risk when they had no family history of a condition or only one affected second degree relative. They were deemed moderate risk in cases when there was one first and second degree relative, one first degree relative, or at least two second degree relatives with diabetes. Finally, they were placed in the high risk category if they had at least two affected first degree relatives or one first degree relative and one second degree relative from the same side of the family (21). Results indicated that 22.7% of individuals in the sample were at moderate risk and 7.5% were at high risk. Overall, they found that individuals with a positive family history were at two to six times greater risk to develop diabetes, a finding that is consistent with past research (21). Other common diseases, including certain types of cancer, can affect multiple family members within a family. While there are some specific genetic causes for certain types of cancer, the majority of cancer seen in families is multifactorial. Scheuner et al. reported 18% of individuals studied reported a family history of cancer (2).

Unlike single gene disorders that have a clear pattern of inheritance, multifactorial diseases are less predictable. In order to give someone a risk for the common chronic diseases that are most prevalent in the general population, criteria had to be created to evaluate a family history and assign risk. Scheuner et al. developed criteria to classify an individual's risk for common health conditions into one of three categories, average (general population risk), moderate, or high, based on his or her family history (2). Assessment of risk depends on the number of relatives affected with a particular condition and their ages at diagnosis (2, 17, 22). Individuals who have multiple close relatives with a particular condition diagnosed at earlier than expected ages (generally before age 50, although age can vary depending on the condition) tend to be at the highest risk for disease. Scheuner et al. did family histories for 400 healthy

people. Individuals were classified as having a positive family history and therefore, at increased risk for disease when they had at least one first degree relative, or two affected second degree relatives from the same side of the family with a particular disease (2). Ultimately, 5 to 15% of participants were found to be at moderate risk and 1 to 10% were at high risk for at least one disease (2, 17). The risk stratification created by Scheuner et al. can be used to make recommendations regarding preventative measures for individuals, including informing those in the moderate and high risk categories about strategies to modify risk factors like diet and screening practices. Average risk individuals should be encouraged to maintain healthy behaviors and follow public health recommendations regarding screening and other practices (17, 22). Still, risk assessments are only as accurate as the self-report family history. Studies have shown that self-report family history does indeed have analytical validity (17). One study, the Utah Family Tree Study, reported 77% sensitivity and 85% specificity of the family history in predicting cardiovascular disease (17).

Implementing the family history as a population based screening tool is a cost-effective way to identify a large number of at-risk individuals. The greatest impact on public health may lie in identifying individuals at risk for cardiovascular disease, certain types of cancer, and other common diseases (22). The US Surgeon General and the US Department of Health and Human Services developed the Family History Initiative to address this need. The goal of this national public health campaign was to increase awareness of the importance of the family history and to provide a tool that would allow individuals to collect and organize their family history information. The web based tool found at www.hhs.gov/familyhistory allows individuals to create a professional looking pedigree which can be printed out. Additionally, the pedigree can be accessed online and updated as the family history changes over time. This tool highlights

common health conditions that have existing medical recommendations for prevention including breast cancer, ovarian cancer, colon cancer, stroke, type 2 diabetes, and cardiovascular disease in the family history.

Still, most individuals look to their health care providers, especially their primary care physicians to inform them of their risk for disease and many physicians do not use the family history to guide medical recommendations (20). While some primary care physicians ask questions about family health, very few doctors use this information in discussing patient risks and coming up with prevention strategies (20). One observational study found that only 50% of physicians asked about the family history in the initial patient visit and only 22% asked in subsequent visits. Discussions lasted an average of two and a half minutes and doctors tended to focus the discussion on the psychosocial issues in the family rather than the health risks (17, 18). Based on the above information, it is safe to assume that the family history collected by most doctors is limited (17). Only 11% of patient charts actually contained a family tree with health information (17, 18). Those individuals at moderate risk were most likely to be missed (17).

A family history risk assessment can be a successful intervention to motivate people to understand the conditions for which they are at risk and follow public health prevention recommendations (18, 22). Several studies have shown that families who are told they are at increased risk for disease did change their behaviors to reduce their risk (20). In the 2004 CDC LifeStyles survey, 96.3% of people polled considered knowledge about their family health important to their personal health, with 72.5% stating they felt it was very important and 29.8% stating it was somewhat important (18). According to the Health Belief Model, such initiatives would encourage change when individuals believe: they are susceptible to the condition, it would have potentially serious consequences, that interventions necessary to reduce disease would be

beneficial in delaying or stopping onset or severity of disease, and the barriers are outweighed by the benefits of taking action. Telling people their risk is rarely enough to make someone take action and change behaviors (17).

3.3 COMMUNITY INTERVENTIONS TARGETING THE HEALTH OF AFRICAN AMERICANS

Interventions aimed at improving the overall health of the population are designed to increase physical activity and promote healthy lifestyle changes (23). When many interventions are combined with a single goal, they are considered a "program" (23). While there are many interventions and programs aimed at improving the health of communities of people, few target exclusively the African American population. Since African Americans are often underrepresented in medical and other research, it is not accurate to generalize findings of past research to this population (24). It is important to fill in the gaps in knowledge about effectiveness of interventions since African Americans are more likely to be overweight and obese and are at higher risk for chronic disease than Caucasians (9, 25). As obesity rates continue to escalate in the US, the focus has shifted to public health interventions as a way to improve the health of the population (25). These approaches attempt to tackle the socio-cultural, political, economic, and physical environmental factors that can keep an individual from leading a healthy lifestyle (25). For an intervention or program to be successful, dynamics of the targeted group, setting, and other variables need to be considered (23).

Yancey et al. performed a literature review to identify community-based interventions that either targeted primarily African Americans and other minorities of color or had a large

percentage of minority participants (25). All together they found 23 studies that were conducted between January 1970 and May 2003. Several studies were done that aimed to increase physical activity in African American adults. One such study, Physical Activity for Risk Reduction or PARR, was conducted from 1988-1991 in public housing communities in Birmingham, AL and 99% of the study participants were African American (26). The researchers held focus groups of community residents and from the findings of those groups, they implemented training in exercise instruction for residents in the community. Baseline surveys of demographic and physical activity information were completed by participants and exercise class attendance was recorded for the first and second years of the program. Overall, physical activity level was not found to be different between intervention and control groups, except in a few communities with very enthusiastic resident exercise instructors (25, 26).

ROCK!Richmond, an intervention implemented in the mid to late 1990's, aimed to reduce the incidence of chronic disease for residents of Richmond, VA (24, 25). The intervention offered free exercise classes at schools, churches, workplaces, and recreation centers in underserved areas of the city and used advertising with ethnic role models to promote healthy choices rather than high fat diets and physical inactivity (24, 25). The study recruited mostly older, sedentary African American women. The women had high BMIs as well as family histories of chronic disease (24, 25). The study could have potentially contributed important information about interventions targeting African American women due to its design, but unfortunately this study did not have any outcome data.

Another intervention, Project DIRECT (Diabetes Intervention Reaching and Educating Communities) was put into place in Wake County, NC. Funded by the CDC, state, and local health departments, the goal of the project was to reduce the incidence and/or severity of diabetes

through physical activity in an African American community southeast of Raleigh, NC (25). Again, this study did not have outcome data and therefore, it does not contribute to our understanding of physical activity interventions to reduce the incidence of chronic disease in African American adults.

Yancey et al. did not include one successful program looking at the effect of lifestyle intervention to reduce the incidence of diabetes. The Diabetes Prevention Program (DPP) was a 27 center randomized clinical trial. Participants were all adults over the age of 25 who were either overweight ($BMI \geq 25$) or obese ($BMI \geq 30$) and had impaired glucose tolerance (27). The study included 45% racial and ethnic minorities (20% African Americans) because these groups are at a higher risk for type 2 diabetes than Caucasians (27). The program set the goal of a 5 to 7% weight loss for all participants as well as regular moderate physical activity, such as brisk walking, for at least 150 minutes per week (27). Results indicated that diabetes incidence was reduced by 58% compared with the placebo group (27). The program was a success due to its unique and multifaceted protocol including: clearly defined weight loss and physical activity goals, use of case managers or "lifestyle coaches", a series of 16 classes teaching participants basic information about nutrition, physical activity, and behavioral self-management, supervised exercise sessions at least two times a week, \$100 allotted to each participant to tackle barriers to adherence, strategies that addressed the needs of racial and ethnic minorities (including lifestyle coaches of the same race/ethnic background), and both local and national support for the program participants (27). The Healthy Black Family Project was modeled after the DPP protocol.

All of these interventions aimed to recruit African Americans to gain a better understanding of the population with the goal of reducing the disproportionate burden of disease.

In order to be successful, programs must address the barriers to physical activity that have been repeatedly reported in this population including issues of a lack of transportation or childcare, socioeconomic disparities, lack of health care access, lack of trust in the medical community, and lack of ethnic role models (25). Successful initiatives often include involving the community in planning and implementation, having members of the same racial or ethnic group in leadership roles, offering services in the community, and offering other incentives to join and adhere to the intervention (24, 25). HBFP researchers and staff took into account all of the above suggestions and utilized many of these strategies to help the program become successful.

While some interventions do attempt to target minorities, few have a large enough number of participants and most have not produced outcome data showing a reduction in risk for obesity and chronic diseases (25). As SES is known to play a role in health disparities, it is especially important to target individuals from low-income backgrounds (25). In minority populations, the emphasis tends to be on community interventions rather than programs focused on individuals (25). Due to the past history of exploitation of African Americans, great support and encouragement is needed for a program to be successful.

3.4 RESEARCH INTO THE FACTORS INFLUENCING PHYSICAL ACTIVITY

Increased physical activity is associated with a decreased risk for several chronic diseases, including cardiovascular disease, hypertension and diabetes. Regular physical activity has also been shown to reduce the risks for stroke, colon cancer, osteoporosis, fall-related injuries, and depression (28). Past research has shown that the elderly can benefit from regular physical activity as well which can improve their physical and mental health (29). The benefits of

physical activity appear to be the same at any age (29). Still, despite national campaigns to make the public aware of the benefits of regular exercise, 60% of adults do not get the recommended amount of physical activity and 25% of adults in the US are inactive (28, 30, 31). The national recommendation for physical activity agreed upon by the American College of Sports Medicine and the CDC indicates individuals should do moderate physical activity (e.g. brisk walking, bicycling) for 30 minutes a day, 5 or more days a week or vigorous physical activity (e.g. running, aerobics, swimming) for 20 minutes a day, 3 or more days a week (31). This recommendation is based on the knowledge that light to moderate intensity exercise can lead to the same benefits to health as continuous vigorous exercise (23, 28). Insufficient physical activity is defined as more than 10 minutes per week of moderate or vigorous exercise, but less than recommended levels and inactivity is defined as less than 10 minutes per week moderate or vigorous physical activity (31).

Exercise levels tend to decrease with age and female gender (29). It has been consistently reported that African American women, those with less education, the elderly and the overweight tend to be more inactive than other groups (23). Past studies have also concluded that racial and ethnic minorities in general are more likely to be inactive than Caucasians (32). Among minorities with low income, activity levels did not increase much from 1990 to 2000 and racial/ethnic disparities in physical activity were still present in 2005 (33, 34). Even when controlling for education, income, occupation, employment, and marital status, African Americans tended to be more inactive than Caucasians (32).

African Americans are less likely to get the recommended amount of physical activity and more likely to be inactive than Caucasians which at least partly explains their higher levels of obesity. In 2005, 31.6% of Caucasians met the national recommendation for physical activity,

while only 21.2% of African Americans achieved the same exercise levels (9). In addition, 30.7% of Caucasians were insufficiently active compared with only 22.6% of African Americans (9). African Americans were also more likely to be inactive than Caucasians, 54.7% compared with 38.6% respectively (9). These statistics are similar in Pennsylvania. In 2005, only 41.4% of African Americans residing in Pennsylvania achieved the recommended amount of physical activity compared with 50.8% of Caucasians (35). African Americans were also less likely to get any amount of physical activity (insufficient physical activity) compared with Caucasians, 38.5% versus 37.3% respectively (35). Finally, more African Americans were inactive compared with Caucasians, 21.4% versus 10.8% respectively (35).

Exercise is both a complex and dynamic process. Previous research has indicated that physical activity is not an exclusively reasoned decision and certain factors can predict some of the variation in activity levels between individuals (36, 37). Factors, variables, or determinants of physical activity usually refer to correlates that can be reliably associated with activity level, although cause-effect relationships cannot be determined (37). King and other researchers have shown that demographic, knowledge/attitudes/beliefs, physiological, psychological, social, environmental, and program based variables can influence activity level (30, 36, 38). The Healthy People 2010 initiative aims to reduce the amount of inactive adults in the US to 20% by 2010 (39). Yet, up to 50% of participants in exercise programs drop out within 6 to 12 months of joining and usually the individuals who drop out are at the greatest risk for health problems (29). By identifying factors that influence activity, public health programs and interventions can be tailored to encourage greater levels of participation and greater reduction in disease onset and/or severity (37, 39, 40).

Numerous studies have been done to research the determinants of exercise. For the purpose of this review only predictors of activity for exercise programs will be discussed. Various determinants have been found to have positive associations with activity level in an exercise program. Demographic/personal characteristics with a positive association include: male gender (23, 39, 41), married status (in African Americans) (39, 42), and past program participation (29, 37). Gender is consistently correlated with activity level. Men tend to be more active than women and are more likely to do vigorous physical activity, while women are more likely to do moderate physical activity (41). African American women tend to be the least active (23). Higher levels of education are also correlated with increased physical activity, although education is not a significant predictor of activity after age 65 (23, 29, 43).

Determinants involving an individual's knowledge, attitudes, or beliefs that have been found to have positive associations with activity level include: self-perception of being more active than one's counterparts (44), belief that exercise is outside of one's control or has little value (23, 40), perceived exercise enjoyment and satisfaction (23, 29), perceived access to facilities (especially important among those 65 years and older) (23, 29), greater perceived health (23, 43), knowledge about health, fitness and exercise behaviors (in elderly) (29), perceived available time (37) and self-efficacy (23, 33, 36, 39-41). Perceived self-efficacy or one's confidence in being able to perform a specific behavior or activity has been shown to predict a significant amount of the variation in activity levels across numerous studies (23, 33, 36, 39-41). A review of literature by Trost et al. (2002) found that self-efficacy could predict variance in exercise adherence even two years after the start of a physical activity program (40).

Several physiological variables have been found to have a positive association with physical activity including: greater respiratory endurance and psychomotor speed (in the elderly)

(29), functional mobility (in the elderly) (29), circulatory disability (found in some studies) (37), and a high degree of aerobic fitness (found in some studies) (37).

In terms of psychological variables, self-motivation has been found to be the most important in predicting activity level (23, 40, 43). Social variables with a positive association with activity level include: social support from friends, peers, family, and/or spouse, and physician influence (40). Access to facilities was most important in terms of environmental factors (37, 40).

Some variables have also been found to have a negative association with activity level. Demographic factors with a negative association with physical activity include: smoking (modest effect) (23, 40), racial and ethnic minority status (40), and lower SES (40). Age, one of the most consistent correlates has a negative association that begins in early adulthood (23, 33, 40, 43). Finally, those individuals who are overweight or obese are less likely to be active (37, 40, 44). Up to 70% of obese individuals quit fitness programs within one year of joining (37). Obesity has been found to be associated with decreased physical activity in most of the adult populations that have been studied (23). The majority of community intervention programs have a supervised group based exercise format and King et al. (1997) found that individuals who were at least moderately overweight (BMI of 27 or greater) tended to be most likely to fail in these types of programs (30). Individuals who are overweight or obese may experience psychological discomfort or embarrassment in situations involving group-based exercise (23, 30). Other variables with a negative association include: increased risk for heart disease (in men), although this was a weak association (23, 40), poor health (23, 29, 33, 38, 39), climate/season, and mood disturbance (37, 40).

Research studies looking at the effect of health appraisal and fitness testing on activity have reported mixed results. Knowledge of ability on fitness testing by itself has been found to increase intentions to exercise initially, but significant change in behavior was not noted three months after initiation of an exercise program (23). Modest increases in activity were seen for individuals who had a health risk appraisal, fitness testing and education about physical activity, but six months after the intervention or program most of these gains were lost (23).

Most of the above determinants of physical activity and adherence were identified through use of multiple linear and/or logistic regression analyses of self-report data. One study by King et al. (1997) used signal detection methodology (SDT) instead of these traditional statistical methods to explore variables that predicted both short (1 year) and long (2 years) term exercise participation (30). One limitation when using regression techniques is that researchers cannot identify how predictors are interacting with each other. SDT allows researchers to identify how different variables interact with each other over time, with the caveat that the outcome measure must be dichotomous (30). This study looked at baseline measures of demographic, physiological, and psychosocial factors in four different groups: high-intensity group based exercise, high-intensity home based exercise, low-intensity home based exercise, and control (assessment only, no physical activity grouping) (30). Study participants (n = 357) were healthy, initially non-active men and women from a moderate sized northern California town between the ages of 50 and 65 (30). The dichotomous outcome variable was success (30). A participant was determined to be “successful” if he or she adhered to the prescribed exercise routine two thirds of the time and “unsuccessful” if he or she did not. In terms of group-based exercise, participants with a lower baseline BMI (less than or equal to 27) were more likely to be “successful” at year 1 and 2, and those who reported higher energy were also more likely to be

“successful” in year 1 (30). Those with higher BMI in the group based program were the least likely to be “successful” out of all groups (30). There were no other significant predictors of activity in those assigned to the group based program (30). Participants in either of the two home-based programs were more “successful” than those in the group based program in both year 1 and 2 (30). Individuals who were most likely to succeed in year 1 were non-smokers, with average or higher level of family satisfaction, reported lower levels of stress, normal-weight (BMI less than or equal to 27) and higher energy scores at baseline (30). In year 2, individuals were most likely to be active or “successful” if they were initially less stressed, had less education or initially higher fitness levels (30).

While these research studies have contributed to the general knowledge about determinants of activity, few studies have looked at variables influencing activity across different settings, populations, and over various time periods (23, 37, 43). As with medical research, racial and ethnic minorities, including African Americans, tend to be underrepresented in the past studies looking at the determinants of physical activity. Additionally, relatively few studies have examined the effects of various determinants in regards to type of activity regimen (23).

King et al. found that variables measured at baseline can predict exercise adherence up to 2 years after starting an exercise program (30). It is one of the only studies that looked at exercise participation and adherence over such an extended period. Most of the studies reported in the literature only examine variables influencing physical activity over shorter periods of time, usually several weeks to several months. Furthermore, the study differentiated determinants between different types of programs, but again, African Americans were underrepresented (30). The sample was largely composed of well educated Caucasians (30).

The present study aims to fill some of the gaps in the current research by characterizing determinants of activity in African Americans participating in a community group-based exercise program over a period of 18 months.

4.0 MATERIALS AND METHODS

The design for this study was approved by the University of Pittsburgh's Institutional Review Board (IRB) on September 17, 2007 (replication of IRB approval letter for protocol # 07070242 can be found in Appendix A).

4.1 HEALTHY BLACK FAMILY PROJECT

The Healthy Black Family Project (HBFP) is a program created and run by the Center for Minority Health (CMH) at the University of Pittsburgh's Graduate School of Public Health. The CMH was established with the goal of reducing racial and ethnic health disparities. The HBFP is a health promotion program that strives to reduce racial and ethnic health disparities through disease prevention, specifically aiming to reduce the prevalence of hypertension and diabetes in the African American community of Pittsburgh. Men and women aged 18 and older are invited to participate in nutrition, stress management, smoking cessation, and low-impact physical activity classes free of cost. A wide variety of physical activity classes are offered including: yoga, African dance, body toning, walking, and water aerobics. The HBFP is housed at two sites within the city of Pittsburgh: the Kingsley Association in East Liberty and Hosanna House in Wilkinsburg. These locations were chosen because they are located in the Health Empowerment Zone (see Figure 1.) as designated by the CMH.

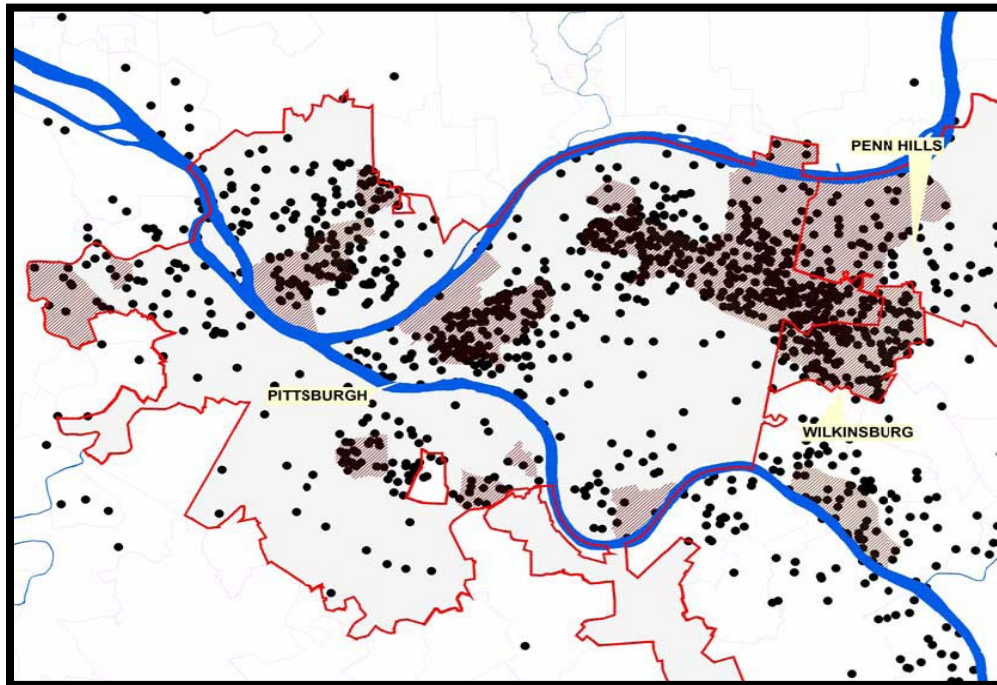


Figure 1. Health Empowerment Zone Map (1 dot = 100 African Americans)

The Health Empowerment Zone is a geographic area where the majority of African Americans in the city of Pittsburgh live. This area consists of neighborhoods in the East End of Pittsburgh including: Garfield, Lincoln-Larimer, Point Breeze (North), Homewood, Hill District, East Hills, East Liberty, and Wilkinsburg (see Table 1.). Forty one percent of the residents in these communities are African American and 27.1% of citizens in these areas live below the poverty line.

Table 1. Health Empowerment Zone

Zip Code	Neighborhood
15147	<ul style="list-style-type: none">▪ Penn Hills
15206	<ul style="list-style-type: none">▪ Lincoln-Lemington-Belmar▪ East Liberty▪ Larimer▪ Garfield
15207	<ul style="list-style-type: none">▪ Glen Hazel
15208	<ul style="list-style-type: none">▪ Point Breeze (North)▪ Homewood
15213	<ul style="list-style-type: none">▪ Terrace Village
15219	<ul style="list-style-type: none">▪ Bedford Dwellings▪ Crawford Roberts▪ Terrace Village▪ Hill District
15221	<ul style="list-style-type: none">▪ East Hills▪ Wilkinsburg
15224	<ul style="list-style-type: none">▪ Garfield

4.2 FAMILY HEALTH HISTORY INITIATIVE

The Family Health History Initiative was established in 2003 and is an integral part of the Healthy Black Family Project. This part of the program was designed to make participants aware of the role that family history can play in risk for disease. Students in the Genetic Counseling Program at the University of Pittsburgh's Graduate School of Public Health participate in community health fairs and HBFP orientations to discuss the importance of the family health history. Attendees can sign up for a family health history session at that time. Genetic counseling students also call existing members of the HBFP who have not completed their family health history to ask if they are interested in discussing their family health information and having a risk assessment done. The students then set up a meeting time and location with the participant over the phone. Typically, family health history sessions are done at the Kingsley Association, although sometimes meetings take place at Hosanna House. During the 45 minute to 1 hour session, the participant discusses his or her family health information while the student draws out a detailed three generation pedigree. Subsequently, the student discusses the participant's risk for chronic health conditions based on their family history including: cardiovascular disease, hypertension, type 2 diabetes, breast cancer, colon cancer, prostate cancer (men only), and ovarian cancer (women only). The risk assessment is based on the work of Scheuner et al. (1997) who established criteria for assessing risk for chronic disease from the family history (see Table 2.) (2). The age for a diagnosis of hypertension to be considered early onset was not established in this paper, but the age of 50 or younger was chosen to be conservative. Based on the family history information, the participant is told he or she is at average, moderate, or high risk for each of the conditions mentioned above. The participant is then told about behavior modification strategies that may help him or her to reduce the risk for

health conditions that run in the family, such as attending the physical activity or nutrition classes available through the HBFP.

Table 2. Scheuner's Risk Stratification

Average Risk	Moderate Risk	High Risk
<ol style="list-style-type: none"> 1. No affected relatives 2. One affected second degree relative from one or both sides of the family 3. No known family history 4. Adopted individual with unknown family history 	<ol style="list-style-type: none"> 1. A first degree relative with late or unknown onset of disease 2. Two second degree relatives from the same lineage with late or unknown disease onset 	<ol style="list-style-type: none"> 1. Premature disease in a first degree relative 2. Premature coronary artery disease in a second degree relative 3. Two affected first degree relatives 4. A first degree relative with late/unknown onset of disease and an affected second degree relative from the same lineage with premature disease 5. Two second degree maternal or paternal relatives with at least one having premature disease 6. Three or more maternal or paternal relatives 7. The presence of moderate risk on both sides of the family
<p>Premature coronary artery disease: 55 or younger in males; 65 or younger in females Premature stroke, diabetes, colon cancer, and prostate cancer: 50 or younger Premature breast and ovarian cancer: 50 or younger or premenopausal</p>		

At the end of the session, the participant is given the hand-drawn copy of the pedigree. The student also takes a copy of the participant's pedigree back to the CMH, where it is entered into the computer using Progeny® software. The computer-generated pedigree is then sent to the participant along with information about health conditions he or she is at risk for, other information that may be helpful, a letter of appreciation and a certificate of completion.

4.3 DATA ANALYSIS

All participants complete a baseline fitness assessment (see Appendix B) upon joining the HBFP. The fitness assessment consists of measures of weight (in pounds), bioelectrical impedance body fat percentage, BMI (calculated as $\text{weight}/\text{height}^2$), waist size (in cm), hip size (in cm), waist-hip ratio (waist size/hip size) and height (in cm). The fitness assessment also consists of several fitness tests. Participants complete only one of these tests depending on their ability. The hardest test is the “three-minute step test”. Participants who are able to do this test must climb up and down on a step for 3 minutes after which time their heart rate is measured in beats per minute. The moderate difficulty fitness test is the “modified chair stand”. This fitness test measures how many times a participant can stand up from his or her chair and sit back down in 30 seconds time. If a participant cannot do either one of these tests, the participant is asked to do the “modified eight-foot up and go”. This test measures how many seconds it takes a participant to stand up from a seated position and walk eight feet. Finally, the fitness assessment measures a participant’s flexibility. There are two tests of flexibility and like the fitness tests, participants only complete one of these tests based on their ability. The regular flexibility testing or “sit-reach hip flexion” consists of the participant being seated on the floor and asked to reach as far as he or she can. The number of centimeters that he or she then reaches past his or her toes is recorded. For participants who are unable to do the regular testing, a modified test of flexibility, the “modified chair sit-reach” is done. The participant is asked to sit in a chair and put one leg out straight, with his or her heel on the floor. The participant is then asked to clasp his or her hands over his or her head and reach over the extended leg as far as he or she can. Like the regular “sit-reach hip flexion”, the number of centimeters the participant can reach past his or her toes is recorded. This test can result in negative values for participants who cannot reach past

their toes. In addition to the fitness assessment, all new members of the HBFP complete a baseline questionnaire (see Appendix C). The questionnaire asks about medical screening/history, family history, medications, and lifestyle (smoker/previous smoker, daily stress, and dietary habits).

Data was collected for all participants who completed a baseline fitness assessment and questionnaire from July 1, 2005 to December 31, 2006. During this 18-month time period, baseline information was collected for 1,927 people. After accounting for those participants who were entered into the data management system twice as well as those who were missing most fitness assessment and/or questionnaire information, 1,879 participants met criteria for analysis. Identifying information for these participants was removed and linkage codes were created by Dr. Anthony Robins, the program director for the Healthy Black Family Project. Only Dr. Robins can link the information back to the participant's identifying information. Anonymized data for these participants was then transferred into a Microsoft® Excel spreadsheet.

The data from the baseline fitness assessment and questionnaire were then coded. The baseline fitness and flexibility tests were coded as numbers based on ability (see Table 3.). In addition, similar questions from the baseline survey were grouped together to form coded variables (see Table 4.). Only the coded variables found in Table 4, were analyzed from the baseline questionnaire. Individuals who answered "yes" to one or more of the questions included in the coded variable were "true" for that variable. A participant was considered "true" for the coded variable "stress" if he or she did not answer "low".

Table 3. Coding for Fitness and Flexibility Tests Based on Ability

Baseline Fitness Test	Test Coding	Baseline Flexibility Test	Test Coding
Three-minute step test (hard)	3		
Modified Chair Stand (moderate)	2	Sit-Reach Hip Flexion (regular)	2
Modified eight-foot up and go (easy)	1	Modified Sit-Reach Hip Flexion (modified)	1

Table 4. Coding for Baseline Questionnaire Variables

Coded Variables	Questions from Baseline Survey
Cardiovascular Concerns	<ul style="list-style-type: none"> ▪ Do you have any personal history of heart disease (coronary or atherosclerotic disease)? ▪ Have you experienced pain or discomfort in your chest apparently due to blood flow deficiency? ▪ Do you have any unaccustomed shortness of breath (perhaps during light exercise)? ▪ Have you had any problems with dizziness or fainting? ▪ Do you have difficulty breathing while standing or sudden breathing problems at night? ▪ Have you experienced a rapid throbbing or fluttering of the heart? ▪ Do you suffer from ankle edema (swelling of the ankles)? ▪ Have you experienced severe pain in leg muscles during walking? ▪ Do you have a known heart murmur? ▪ Has your serum cholesterol been measured at greater than 200 mg/dl?
Diabetes	<ul style="list-style-type: none"> ▪ Do you have a personal history of diabetes or other metabolic disease (thyroid, renal, liver)? ▪ Have you had high fasting blood glucose level on 2 or more occasions (≥ 110 mg/dl)?
Hypertension	<ul style="list-style-type: none"> ▪ Have you been told your blood pressure was high on at least 2 occasions (systolic > 140 or diastolic > 90)? ▪ Are you currently being treated for high blood pressure?
Sedentary	<ul style="list-style-type: none"> ▪ Would you characterize your lifestyle as laid back, still, little to no exercise?

(Table 4 continued) Obesity	<ul style="list-style-type: none"> Are you 20% or more overweight or have you been told your “BMI” was greater than 30?
Breathing Problems	<ul style="list-style-type: none"> Do you have any personal history of pulmonary disease, asthma, interstitial lung disease or cystic fibrosis? Asthma? Emphysema? Other lung problems?
Movement Problems	<ul style="list-style-type: none"> Limited range of motion? Arthritis? Bursitis? Swollen or painful joints? Foot problems? Knee Problems? Back Problems? Shoulder Problems?
Neurological Concerns	<ul style="list-style-type: none"> Stroke? Epilepsy or seizures? Chronic headaches or migraines?
Current Smoker	<ul style="list-style-type: none"> Are you a cigarette smoker? (asked twice in survey)
Other	<ul style="list-style-type: none"> Persistent fatigue? Stomach problems? Anemia?
FH* of Cardiovascular Disease	<ul style="list-style-type: none"> Do you have any family history of heart disease prior to age 55? Has your mother, father or siblings suffered from... <ul style="list-style-type: none"> Heart attack or surgery before age 55? Congenital heart disease or left ventricular hypertrophy?
FH* of Hypertension	<ul style="list-style-type: none"> Has your mother, father, or siblings suffered from hypertension (high blood pressure)?
FH* of High Cholesterol	<ul style="list-style-type: none"> Has your mother, father, or siblings suffered from high cholesterol?
FH* of Diabetes	<ul style="list-style-type: none"> Has your mother, father, or siblings suffered from diabetes?
FH* of Obesity	<ul style="list-style-type: none"> Has your mother, father, or siblings suffered from obesity?
Stress Level	<ul style="list-style-type: none"> Please rate your daily stress levels (select one): low, moderate, high: I enjoy the challenge, high: sometimes difficult to handle, high: often difficult to handle

* FH = Family history

In addition, of the 1,879 participants who met criteria for analysis, a subgroup of 209 completed a family health history session and risk assessment with a genetic counseling student. We chose only to analyze the data from those who had their family history done 3 months before or 3 months after their initial fitness assessment ($n = 109$), since we felt beyond this time period it would be hard to assume family history had a significant impact on participants' activity levels. Of these 109 participants, only 98 had risk assessment information recorded in Progeny® and therefore only data from those participants was able to be analyzed. Only the objective risks (average, moderate, high) for cardiovascular disease, hypertension, and diabetes were analyzed since increased physical activity is the recommendation that is given to reduce risk for these chronic conditions.

4.3.1 Stepwise Multiple Linear Regression

Stepwise multiple linear regression of the active group ($n = 988$) and the top quartile of the active group ($n = 247$) was done using the SPSS® 15.0 statistical software package. Age, specific baseline fitness assessment variables (BMI, body fat percentage, waist size, fitness ability, and flexibility ability), and all coded questionnaire variables served as independent variables for this research. Activity ratio served as the dependent variable and was derived by taking the number of fitness classes a participant attended between July 1, 2005 and December 31, 2006 divided by the days they were a member of the HBFP during that time period (e.g. number of days from their fitness assessment to December 31, 2006). For example, if a participant attended one exercise class and completed his or her baseline fitness assessment on December 31, 2006, the activity ratio would be 1/1 or 1. Creating an activity ratio ensured all

participants could be compared with the dependent variable. Only physical exercise class attendance was included when calculating the activity ratio. Participant attendance in nutrition, stress management, smoking cessation, and/or other classes offered through the HBFP was excluded since this study aimed to identify predictors of physical activity only. Therefore, some of the participants who were deemed “non-active” in this study may actively participate in other classes offered through the HBFP.

4.3.2 T-Tests and Chi-Square Testing

T-tests and chi-square tests were done using the SPSS® 15.0 statistical software package to look for significant differences between several groups: the non-active (n = 891) versus active group (n = 988), the non-active (n = 891) versus top quartile of the active group (n = 247), and the bottom quartile of the active group (n = 245) versus the top quartile of the active group (n = 247). In addition, chi-square testing was done for the subgroup of participants who completed a family health history and met criteria for analysis (n = 98). Independent sample T-tests were used to analyze continuous variables and chi-square testing was done to analyze differences in nominal and ordinal variables between groups. A p-value of 0.05 or higher was considered significant for these analyses.

5.0 RESULTS

5.1 DEMOGRAPHICS

All data used for this study was collected through the Healthy Black Family Project and the Family Health History Initiative. Data collected on 1,879 participants between July 1, 2005 and December 31, 2006 was studied. 988 participants attended at least one exercise class (active group) and 891 participants never attended an exercise class (non-active group). Of all participants studied ($n = 1879$), 85% were women and 15% were men, with a median age of 51. Information regarding race was not asked in the baseline questionnaire, but the program specifically targets African Americans living within the Health Empowerment Zone. The sample is reported to be >98% African-American based on the report of HBFP staff who met with each participant individually at the time of the baseline fitness assessment. Figure 2. illustrates the average number of classes attended in the different groups analyzed. The average number of exercise classes attended by participants in the active group was 14, with a range from 1 to 214. Participants in the bottom quartile of the active group ($n = 245$) attended an average of 1 class, with a range from 1 to 4. Participants in the top quartile of the active group ($n = 247$) attended an average of 39 classes, with a range from 1 to 214 classes. The same range of exercise classes is reported for the top quartile active group and the overall active group, because

the activity ratio, not activity count (straight attendance), served as the dependent variable for these analyses.

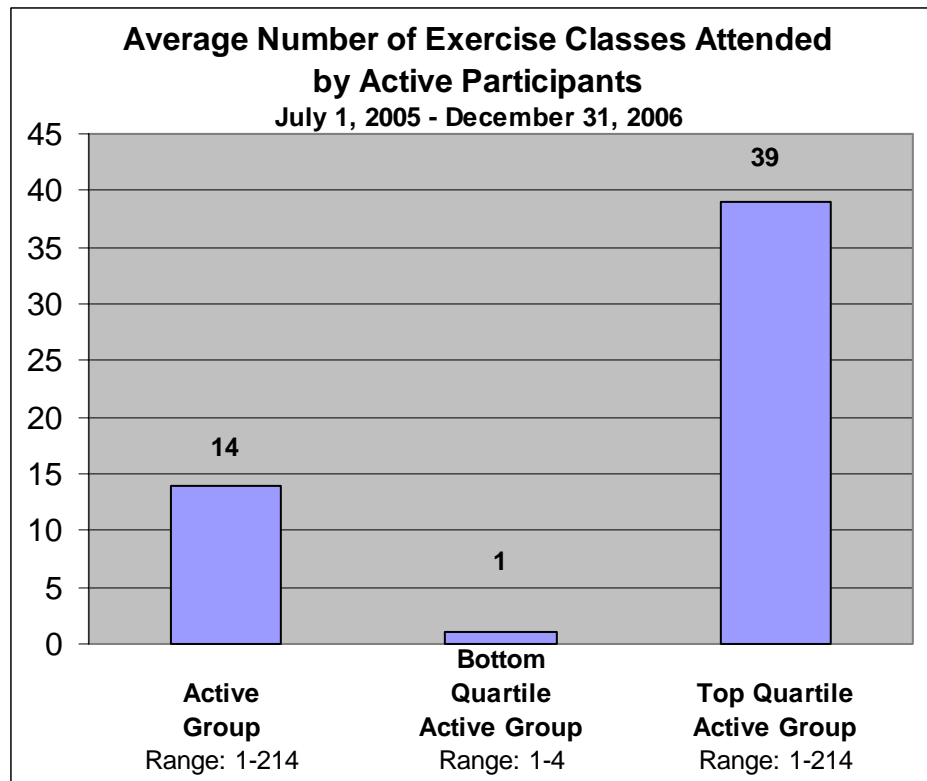


Figure 2. Average Number of Exercise Classes Attended by Active Participants

Subanalysis including participants who completed a family history risk assessment with a genetic counseling student included data from 98 participants that met criteria for analysis. Of those 98 participants, 66 attended at least one exercise class (active group) and 32 never attended an exercise class (non-active group). This group consisted of 86% women and 14% men, with a median age of 52. 98% of participants indicated they were African American, 1% indicated they were American Indian/Alaska Native, and 1% indicated “Other” as their race.

5.2 SPECIFIC AIM 1

Stepwise multiple linear regression was conducted for the active group, as well as the top quartile of the active group of participants. A p-value of 0.10 indicated variables to be entered into the regression analysis and a p-value of 0.11 indicated variables to be removed. While p-values of 0.05 to enter and 0.10 to remove are typically used in these analyses, we chose to use higher values in an attempt to identify any significant or close to significant effects. Stepwise regression of the active group indicated that increased activity was significantly correlated with increased body fat percentage ($p = 0.001$), decreased BMI ($p = 0.028$), and decreased flexibility ($p = 0.088$) (see Table 5.). Overall, the adjusted R^2 value indicated that 2% of the total variation in activity levels in the active group was accounted for by body fat, BMI, and flexibility, in that order.

Stepwise regression was then conducted for the top quartile of the active group to see if similar predictors of activity were indicated. In this group, increased activity was associated with a family history of diabetes ($p = 0.006$) and a personal history of cardiovascular concerns ($p = 0.016$) (see table 5). The adjusted R^2 value indicated that 5.3% of the total variation in activity levels in the top quartile of the active group could be accounted for first by a family history of diabetes and then by a personal history of cardiovascular concerns.

Table 5. Results of Stepwise Linear Regressions

Predictor	Beta coefficient	P-value
Active group (N = 988)		
1. Body Fat Percentage	0.181	0.001
2. BMI	-0.116	0.028
3. Flexibility	-0.065	0.088
Top Quartile Active group (N = 247)		
1. Family History of Diabetes (self-report)	0.204	0.006
2. Personal History of Cardiovascular Concerns	0.18	0.016

BMI and flexibility were each analyzed alone to see what effect they had on activity level in the active group. When analyzed separately, BMI appears to have no effect on physical activity level (adjusted R^2 : -0.001), while flexibility (adjusted R^2 : 0.007) appears to account for 0.07% of the variation in activity level. The variable, personal history of cardiovascular concerns, was also analyzed to see its effect on activity level of the top quartile active group. With an adjusted R^2 value of .17, this variable appears to account for 1.7% of variation when examined alone.

5.3 SPECIFIC AIM 2

In order to determine if there were significant differences between groups, independent sample t-tests and chi-square testing was conducted. Analyses comparing the non-active and active groups, the non-active and top quartile of the active groups, and the bottom quartile and top

quartile of the active groups were conducted. Table 6. illustrates the results of these analyses, including significant findings ($p < 0.05$).

Table 6. T-test and Chi-square Test Results for Groups

Variable	Non-active group	Active group	Bottom Quartile Active group	Top Quartile Active Group
N	891	988	245	247
Age (years)	$48.6 \pm 13.7^{*‡}$	$51.0 \pm 13.2^{\bullet}$	51.0 ± 13.2	$52.0 \pm 12.2^{*‡}$
<u>Assessment measures</u>				
BMI (height/weight ²)	33.8 ± 8.1	33.8 ± 7.4	33.7 ± 7.5	33.8 ± 7.2
Body Fat (%)	$37.2 \pm 8.6^{*‡}$	$39.5 \pm 6.9^{\bullet}$	39.3 ± 7.3	$40.5 \pm 5.8^{*‡}$
Waist Size (inches)	40.0 ± 6.9	39.7 ± 6.4	39.6 ± 6.5	39.8 ± 5.9
Fitness Ability	2.6 ± 0.6	2.6 ± 0.6	2.6 ± 0.7	2.6 ± 0.6
Flexibility	$1.8 \pm 0.4^{*‡}$	$1.7 \pm 0.5^{\bullet}$	$1.8 \pm 0.4^{\S}$	$1.7 \pm 0.5^{*‡\S}$
<u>Survey measures</u>				
Cardiovascular Concerns (%)	50	52	50	50
Diabetes (%)	28 [•]	33 [•]	40	30
Hypertension (%)	43 ^{•‡}	50 [•]	53	53 [‡]
Sedentary (%)	26	27	26	26
Obesity (%)	49	53	53	55
Other (%)	19	18	22	16
Breathing Problems (%)	19	17	19	17
Movement Problems (%)	49 [•]	53 [•]	54	50
Neurological Concerns (%)	11 ^{•‡}	7 [•]	7	3 [‡]
Current Smoker (%)	20 ^{•‡}	14 [•]	18 ^{\S}	11 ^{‡\S}
FH* of Cardiovascular Disease (%)	31	32	36	36

Table 6 continued

FH* of Hypertension (%)	47 ^{•‡}	54 [•]	56	62 [‡]
FH* of High Cholesterol (%)	22	24	24	26
FH* of Diabetes (%)	41	45	50	45
FH* of Obesity(%)	27	30	32	28
Stress (%)	83 [‡]	81	84	77 [‡]

*FH = Family history

• Statistically significant difference between active and non-active groups ($p < 0.05$)

[‡] Statistically significant difference between non-active and top quartile active groups ($p < 0.05$)

[¶] Statistically significant difference between bottom quartile active and top quartile active groups ($p < 0.05$)

Individuals in the active group were older ($p = 0.000$), had a higher body fat percentage ($p = 0.000$), were less flexible ($p = 0.015$), had a higher rate of diabetes ($p = 0.044$), hypertension ($p = 0.001$), and movement problems ($p = 0.049$), had fewer neurological concerns ($p = 0.001$), had a lower rate of smoking ($p = 0.000$), and were more likely to have a family history of hypertension ($p = 0.001$) than those in the non-active group (see Figures 3-11.). Individuals in the top quartile of the active group were older ($p = 0.000$), had a higher body fat percentage ($p = 0.000$), were less flexible ($p = 0.008$), had a higher rate of hypertension ($p = 0.004$), had fewer neurological concerns ($p = 0.000$), had a lower rate of smoking ($p = 0.001$), were more likely to have a family history of hypertension ($p = 0.000$), and reported less stress ($p = 0.030$) than the non-active group (see Figures 3-5. and 7-12.). In addition, individuals in the top quartile active group were less flexible ($p = 0.031$) and had a lower rate of smoking ($p = 0.036$) than the bottom quartile active group (see Figures 5. and 10.).

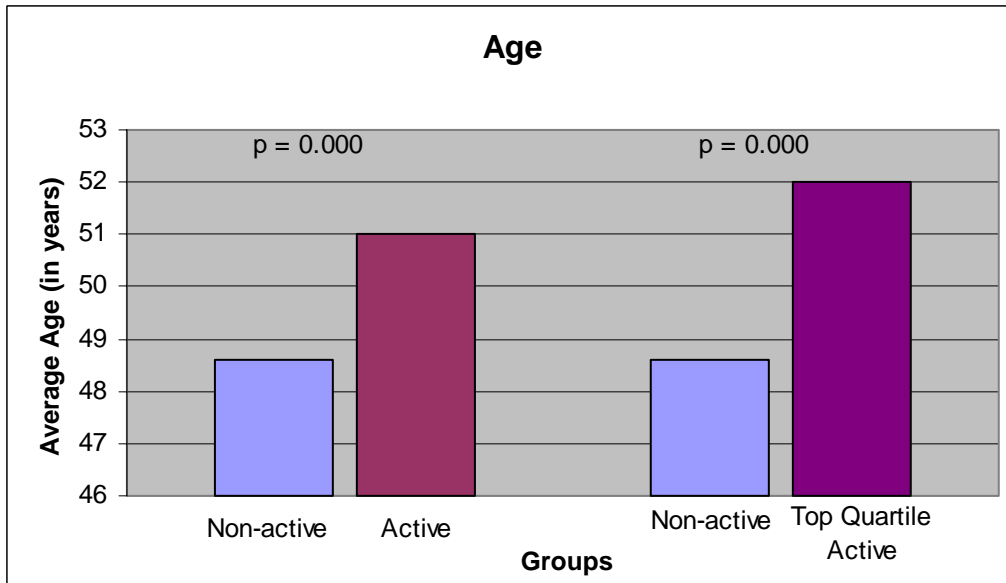


Figure 3. Significant Difference between Groups: Age

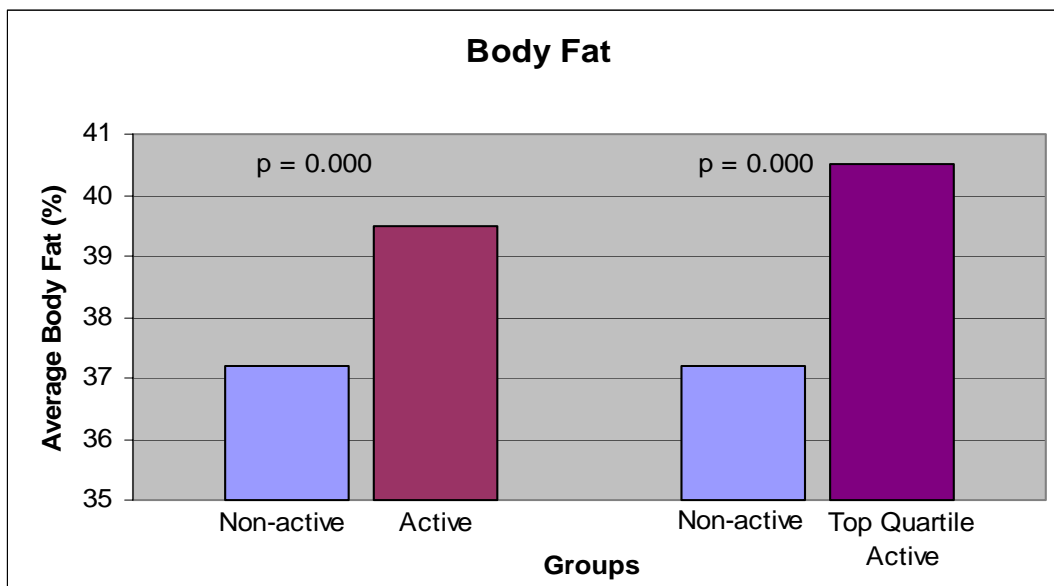


Figure 4. Significant Difference between Groups: Body Fat

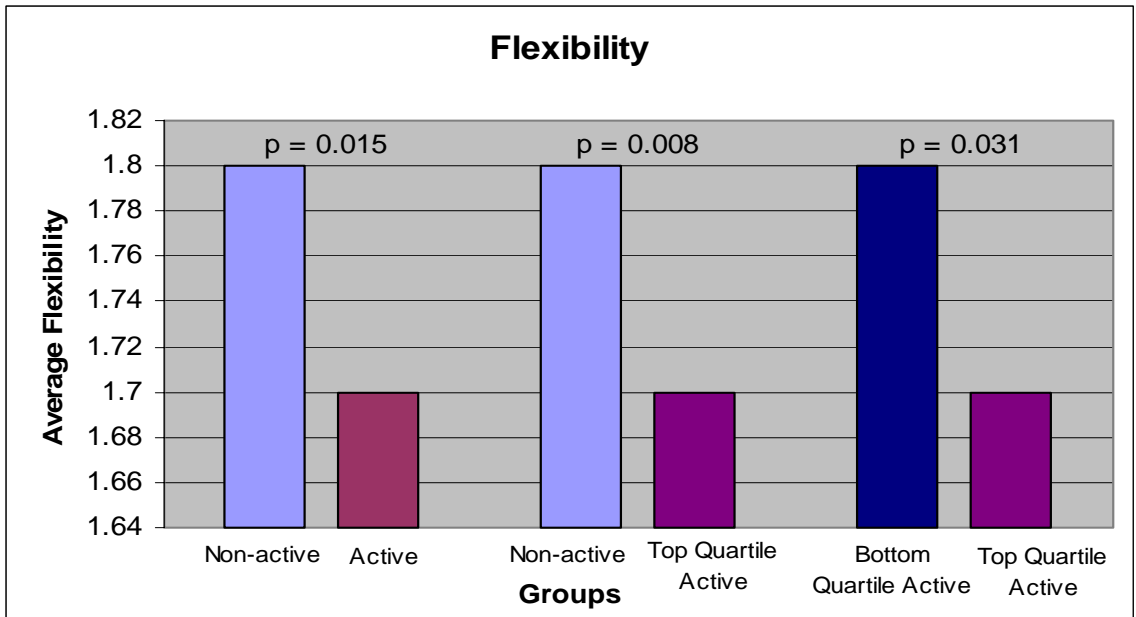


Figure 5. Significant Difference between Groups: Flexibility

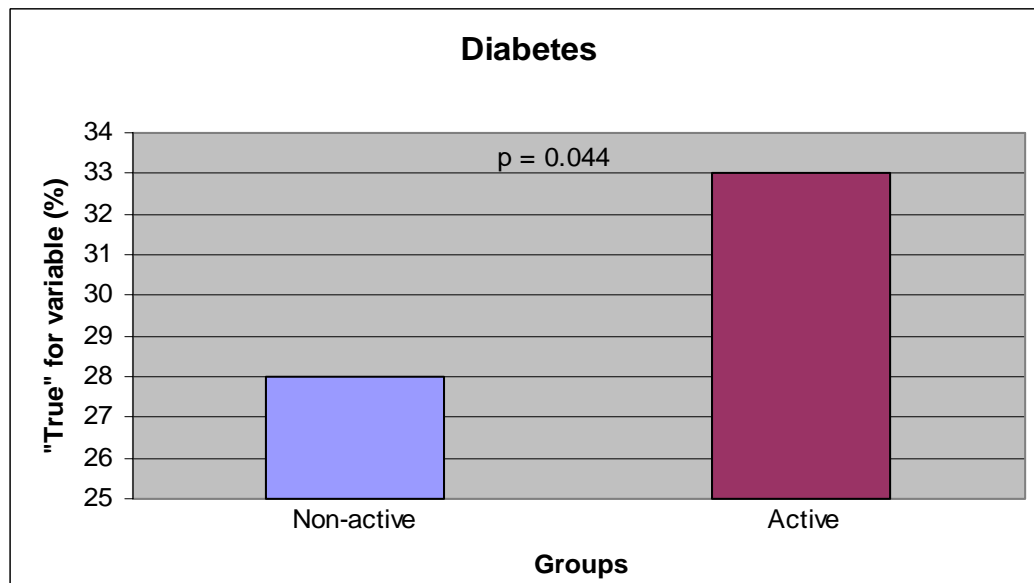


Figure 6. Significant Difference between Groups: Diabetes

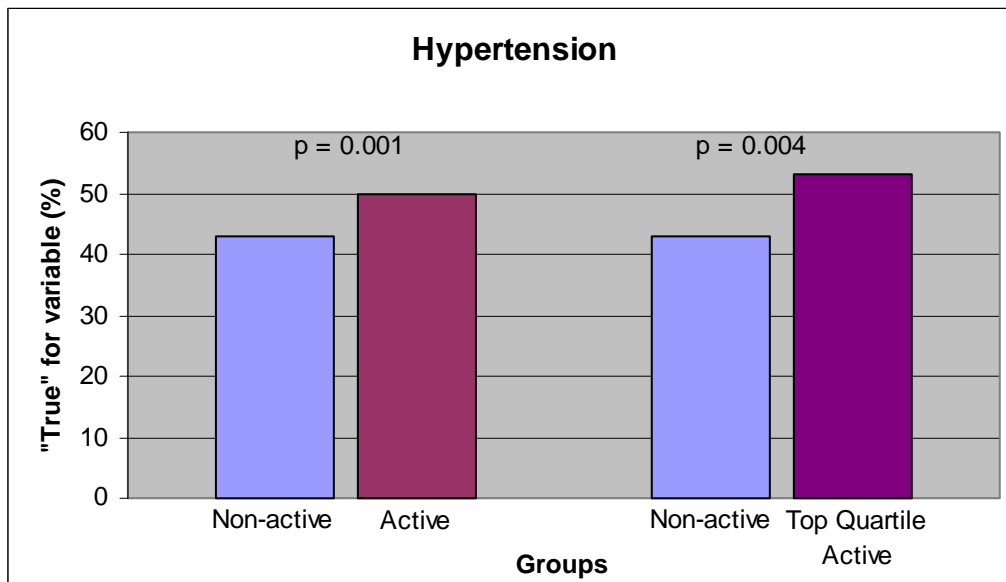


Figure 7. Significant Difference between Groups: Hypertension

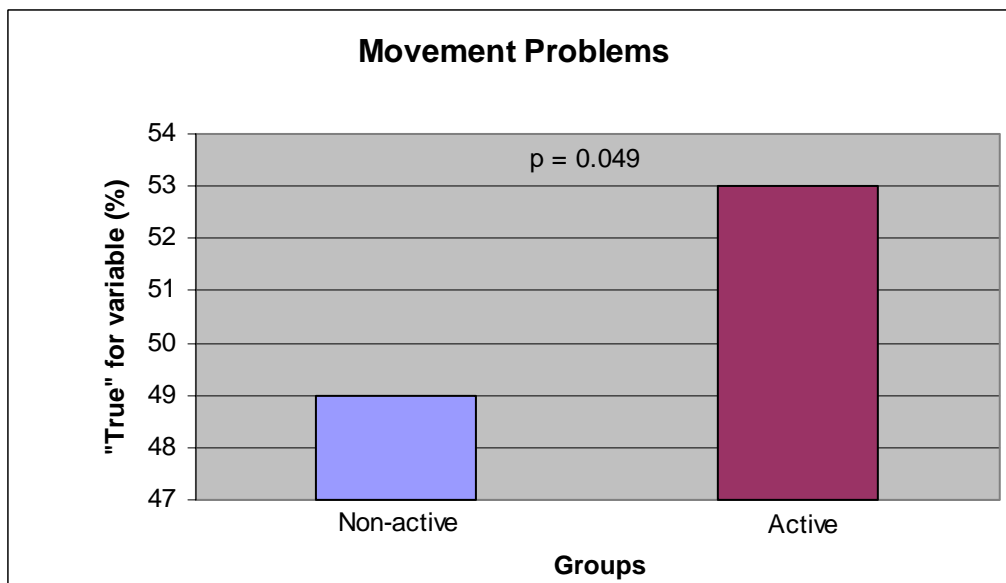


Figure 8. Significant Difference between Groups: Movement Problems

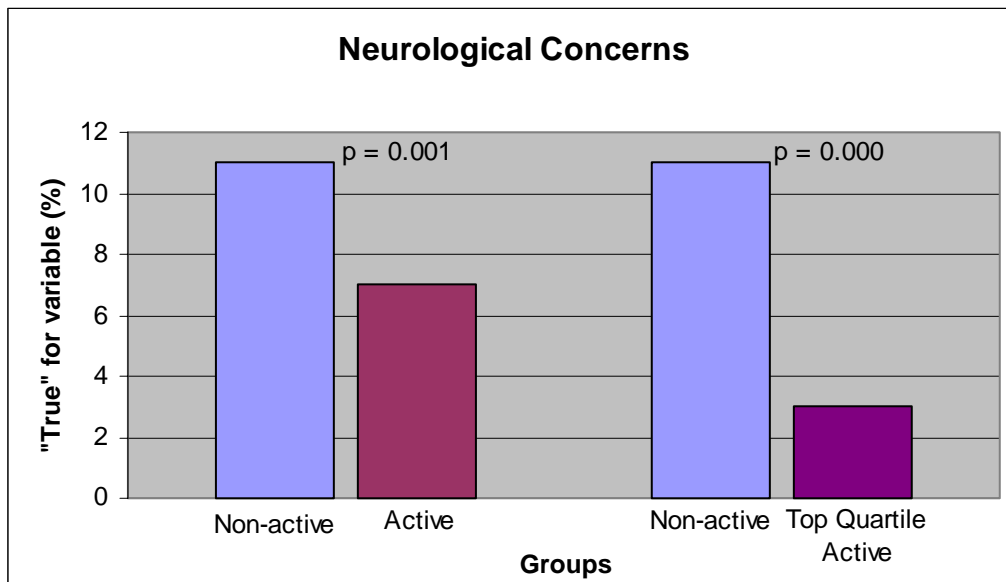


Figure 9. Significant Difference between Groups: Neurological Concerns

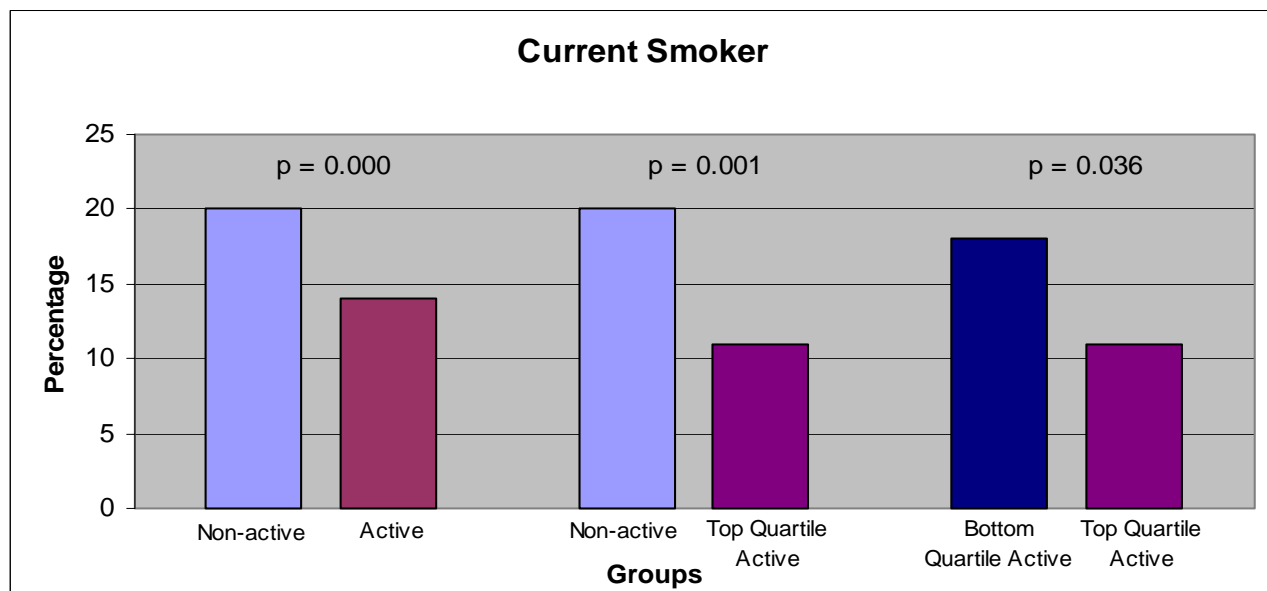


Figure 10. Significant Difference between Groups: Current Smoking

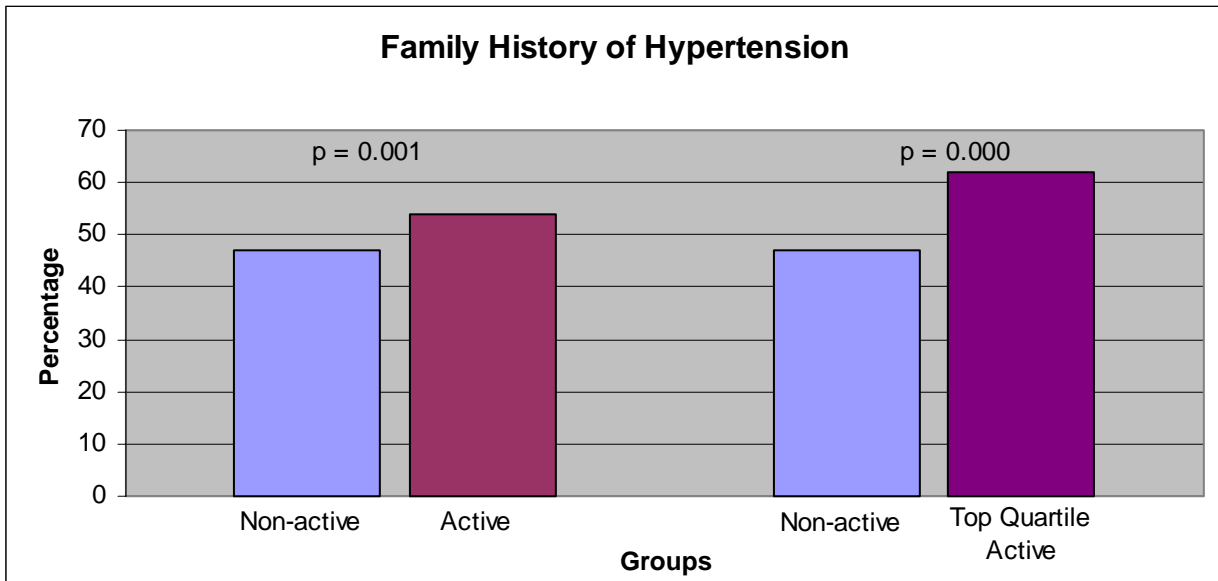


Figure 11. Significant Difference between Groups: Family History of Hypertension

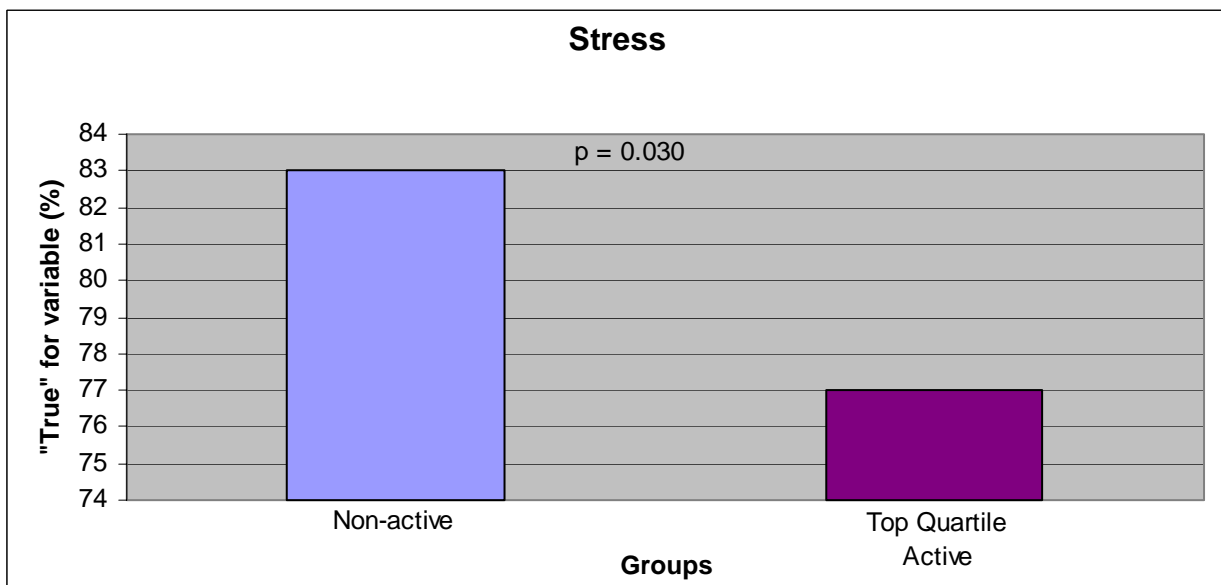


Figure 12. Significant Difference between Groups: Stress

5.4 SPECIFIC AIM 3

Of the individuals who did a family history risk assessment with a genetic counseling student and met criteria for analysis ($n = 98$), 66 attended at least one exercise class (active group) and 32 never attended an exercise class (non-active group). Due to the apparent 2:1 ratio in the groups, a chi-square analysis was done to assess the significance of this difference. Results indicated participants who completed a family health history were significantly more likely to be active ($p < 0.01$). Because we obtained this highly significant result we attempted to determine what might contribute to this increase in physical activity among participants who completed a family history. Further chi-square testing was conducted, with a p-value of 0.05 or greater necessary for a finding to be considered significant. No significant differences were found when comparing the objective risks for cardiovascular disease, hypertension, and diabetes between the two groups. Additionally, chi-square analysis was done to ascertain whether having a family history done before or after the fitness assessment significantly affected individuals' being active or not. Those individuals who completed their family health history the same day as their fitness assessment were included in the "before" group. Analysis indicated that more individuals among the active group had their family health history done after their fitness assessment (68.2%) compared with only 43.8% of the non-active group ($p = 0.02$). Health coaches who work for the HBFP are told to encourage all participants coming in for a fitness assessment to do their family health history, which may explain this finding.

6.0 DISCUSSION

6.1 DEMOGRAPHICS

This research aimed to study predictors of physical activity in an African American population and over 98% of the participants (n = 1879) were reported to be African American by HBFP staff. The majority of study participants (85%) were females with a median age of 51. Of all participants, 988 attended at least one exercise class (active group) and 891 participants never attended an exercise class (non-active group). In both the active and non-active groups, men are underrepresented. The results of this study are probably not generalizable to men due to the small percentage of men studied (15%).

Physical activity class attendance varied greatly among the active group. Those in the bottom quartile of the active group (n = 245) attended an average of just 1 class (range: 1-4), while those in the top quartile of the active group (n = 247) attended an average of 39 classes (range: 1-214). Participants in the overall active group (n = 988) attended an average of 14 classes (range: 1-214). The range of classes attended is the same for the overall active group and the top quartile of the active group. This is due to the activity ratio. The activity ratio was created to allow us to compare participants who joined the HBFP at different times during the 18-month study period, however, it makes it difficult to understand what the number of classes attended actually means in these different groups. We would not expect to see someone who

attended one class considered to be in the top quartile active group, however, if that individual was only a member of the HBFP for 3 days before the end of the study period; his or her activity ratio becomes impressive. In other words, while the average number of classes attended can help us to conceptualize the differences between the various groups, these statistics do little more than that.

Subanalysis including participants who completed a family history risk assessment with a genetic counseling student included data from 98 participants that met criteria for analysis. Of those 98 participants, 66 attended at least one exercise class (active group) and 32 never attended an exercise class (non-active group). Again, this group was largely composed of African American (98%) women (86%) with a median age of 52. The findings of this analysis are most likely not generalizable to men since they made up such a small proportion (14%) of the participants studied. Past research has indicated that women are more likely to seek out health information for themselves and other family members (45). This may explain why so few men completed a family history session. Another possibility for the paucity of men doing family histories is that there is a lack of men in the HBFP in general. The low-impact class format may keep larger numbers of men from joining the program, since men are more likely to participate in vigorous physical activity than women (41).

6.2 SPECIFIC AIM 1

Specific Aim 1: To determine if activity levels in African Americans can be predicted by baseline individual and family health variables including: demographic, medical, anthropometric, fitness, stress and family health factors.

Hypothesis: Previous research has found determinants that predict physical activity levels. Research of baseline characteristics that predict physical activity levels in the African American community is scarce. Based on available research, it was hypothesized that specific baseline individual and family health variables predict some of the variation in activity levels in this population.

Outcome: Stepwise regression done for the active group indicated that increased physical activity was significantly correlated with higher body fat percentage ($p = 0.001$), lower BMI ($p = 0.028$), and less flexibility ($p = 0.088$). Overall, the adjusted R^2 value indicated that 2% of the total variation in activity levels in the active group was accounted for by body fat, BMI, and flexibility, in that order. Stepwise regression was conducted for the top quartile of the active group to see if similar predictors of activity were indicated, however, the analysis revealed different predictors of activity. In this group, increased activity was associated with a family history of diabetes ($p = 0.006$) and a personal history of cardiovascular concerns ($p = 0.016$). The adjusted R^2 value indicated that 5.3% of the total variation in activity levels in the top quartile of the active group was accounted for first by a family history of diabetes and then by a personal history of cardiovascular concerns.

These results support our hypothesis that baseline individual and family health variables can predict a certain amount of the variation in activity in African Americans participating in community intervention programs similar to the Healthy Black Family Project. In the overall active group, physical measures (increased body fat percentage, decreased BMI, and decreased flexibility) were most important in predicting activity. The relationship between body fat and flexibility seem to be consistent, but BMI seems contradictory. When analyzed alone, however, BMI had little to no effect on activity.

The finding that increased body fat has a positive relationship with activity is unexpected. Obesity, defined by a BMI (weight/height²) cutoff of greater than or equal to 30 kg/m², is a condition characterized by increased body fat (46). Obesity has consistently been found to have a negative relationship with activity (37, 40, 44). We would therefore expect increased body fat percentage to have a negative relationship with physical activity; however, as previously stated we found just the opposite.

Decreased flexibility was also significantly associated with increased physical activity, although it was a weak relationship ($p = 0.088$). Flexibility is necessary for daily activities such as getting up out of bed, walking, and climbing stairs. While regular exercise can aid in increasing flexibility, baseline flexibility has not been examined in previous research seeking to identify predictors of activity (47).

The results found in the overall active group may be explained by the efforts of the HBFP. The HBFP is centered in the Health Empowerment Zone of Pittsburgh, where 27.1% of residents live below the poverty level. Low SES is known to be associated with decreased physical activity. Low SES can lead to less access to healthcare and exposure to more risks in lifestyle behaviors and social environment leading to increased risk for disease. Therefore, by the HBFP aiming to recruit participants from the Health Empowerment Zone, the program is targeting those at increased risk for disease. Conversely, the positive association between increased body fat percentage and decreased flexibility with physical activity may be due to participants' knowledge of their fitness assessment results. The variable, knowledge of fitness testing, has been shown to increase initial intentions to exercise in some studies (23). One could speculate that knowledge of poor flexibility and high body fat may be enough for individuals to participate in at least one exercise class deeming them "active" in this study.

Our finding that increased percentage of body fat has a positive relationship with physical activity may also be due, in part, to the method used to measure body fat during the baseline fitness assessment. Body fat percentage was measured using bioelectrical impedance analysis. Machines using bioelectrical impedance actually send a low, safe electrical current through the body. This electrical current encounters the most “bioelectrical impedance” (difficulty) when passing through fat tissue. The machine compares this “impedance” to fat tissue against a person’s height and weight to compute actual body fat percentage. Percentage of body fat may be overestimated if an individual is not hydrated due to not drinking enough liquids, consuming too much caffeine, exercising, or eating before the measurement is taken. Even though our finding indicating that increased body fat is associated with increased physical activity was highly significant ($p = 0.001$), it may not have been as striking had a different method of measuring participants’ body fat been used.

While we expected that we might find similar predictors of physical activity in the most active (top quartile active) individuals, a family history of diabetes and a personal history of cardiovascular concerns were instead found to be significant determinants. In a review of literature by King et al. (1992), men with documented cardiovascular concerns were more likely to adhere to physical activity programs than men who were simply at increased risk for disease (23). Our sample, however, is comprised mostly of women (94% in the top quartile of the active group). Overall, King et al. did not find that a personal history of cardiovascular concerns was associated with increased physical activity in either gender (23). A review of literature by Trost et al. (2002) reported there was a weak, negative relationship between high risk for heart disease and physical activity (40). In contrast to past research, our findings suggest there is a significant positive association ($p = 0.016$) between a personal history of cardiovascular concerns and

physical activity among African American women. In addition, our findings indicate that family history of diabetes has a significant positive association ($p = 0.006$) with physical activity in African American women. Family history of diabetes has not specifically been addressed in past research examining the determinants of physical activity, so it cannot be determined whether this variable is a predictor for other populations as well.

Our results from the top quartile active group have not been found in past studies, however, they are not unexpected. One could stipulate that individuals with a personal or family history of disease at baseline would be motivated to reduce the severity of their illness and/or risk for disease. The benefits of physical activity, including risk reduction for common diseases such as cardiovascular disease and diabetes, are well known. On this note, physician influence may also play a large role in our findings. Physician influence has a strong positive association with physical activity (40). Conversely, our finding regarding a personal history of cardiovascular concerns may be due to our coding of the variable. This variable was created by combining 10 questions from the baseline questionnaire. A participant was considered “true” for “cardiovascular concerns” if he or she answered “yes” to at least 1 of the 10 questions. Some of the questions were direct such as “Do you have a personal history of heart disease?” while others aimed to explore if a participant had an underlying undiagnosed cardiovascular concern with questions such as “Have you experienced rapid throbbing or fluttering of the heart?” Although it was beyond the scope of this research, had the coded variable, “personal history of cardiovascular concerns”, been broken down and analyzed further, our results may have differed. As the variable, “family history of diabetes” was derived from a single, direct question, coding would not explain that finding.

6.3 SPECIFIC AIM 2

Specific Aim 2: To characterize significant differences between participants with various activity levels including: non-active vs. active, non-active vs. top quartile active, and bottom quartile active vs. top quartile active groups.

Hypothesis: Of 1,879 participants who completed a baseline fitness assessment and questionnaire over an 18-month period, 988 attended at least one exercise class (active group) and 891 never attended an exercise class (non-active group). Previous research has delineated the characteristics of individuals with various levels of activity and adherence to exercise programs. Research is scarce regarding characteristics of non-active individuals. Based on past research, it was hypothesized that there are significant differences between the non-active and active groups, the non-active and top quartile active groups, and the bottom quartile and top quartile active groups.

Outcome: As hypothesized, significant differences were found between all groups examined. When comparing the non-active and active groups, the active participants were older ($p = 0.000$), had a higher body fat percentage ($p = 0.000$), were less flexible ($p = 0.015$), had a higher rate of diabetes ($p = 0.044$), hypertension ($p = 0.001$), and movement problems ($p = 0.049$), had fewer neurological concerns ($p = 0.001$), had a lower rate of smoking ($p = 0.000$), and were more likely to have a family history of hypertension ($p = 0.001$) than non-active participants. Data analyses revealed similar findings when comparing the non-active and top quartile active groups. The top quartile active individuals were older ($p = 0.000$), had a higher body fat percentage ($p = 0.000$), were less flexible ($p = 0.008$), had a higher rate of hypertension ($p = 0.004$), had fewer neurological concerns ($p = 0.000$), had a lower rate of smoking ($p = 0.001$), were more likely to have a family history of hypertension ($p = 0.000$), and reported less stress ($p = 0.030$).

Many of the same significant differences were noted between the groups, but there were a few unique findings in the overall active individuals and the top quartile active individuals. Specifically, the overall active group had higher rates of diabetes and movement problems when compared with the non-active individuals. Additionally, the top quartile of the active group reported having less stress than the non-active participants, a finding that was not significant when comparing the overall active group to the non-active group. Past research has indicated sensitivity to stress is reduced after exercise, but have not found any significant correlation between baseline stress level and subsequent physical activity in a group based exercise program (40, 48, 49). One could conjecture that our finding is unique to the population studied. Conversely, our finding may be due to the format of the question used to measure stress on the baseline questionnaire. Participants were simply classified as “true”, if they reported experiencing some level of stress at baseline or “false”, if they did not report experiencing stress. This question lacks the validity of other tested instruments designed to measure stress.

We also conducted chi-square and t-test analyses to compare individuals in the bottom quartile of the active group with individuals in the top quartile of the active group. The top quartile active individuals tended to be less flexible ($p = 0.031$) than the bottom quartile active individuals. We hypothesized that there would be differences between the groups, but did not state the direction of the relationships. Still we conjectured that the most active individuals would be more flexible, not less flexible. While no past studies have looked at the effect of baseline flexibility on physical activity, our data suggests this association is significant for African American women in community based interventions similar to the HBFP. As with our positive association between decreased flexibility and physical activity in the regression analyses, this finding may be due to participants’ knowledge of decreased flexibility after the

fitness assessment. Individuals who are concerned that they are less flexible at baseline may be more likely to attend the exercise classes offered through the HBFP. Additionally, we found that the top quartile active individuals have a significantly lower rate of smoking ($p = 0.036$) than the bottom quartile active individuals. Since smoking has been found to have a modest negative relationship with physical activity, our finding that the most active individuals are less likely to smoke than the least active individuals is not unexpected (23, 40).

In short, many significant differences were found between the active and non-active groups as well as the top quartile active and non-active groups, indicating that the overall active and top quartile active individuals are quite similar to each other. Consistent with our findings from the regression analyses of the active groups, these results indicate that the active individuals tend to have poorer health and are greater risk for disease than the non-active individuals. As previously stated, past research into the determinants of activity has indicated that those in poor health are less likely to be physically active (23, 29, 33, 38, 39). The fact that individuals who have poorer health tend to be more active may again be attributed to the HBFP being centered within the Health Empowerment Zone of Pittsburgh where individuals of lower SES and subsequently higher burden of disease reside. The program also attempts to retain at-risk participants by offering low-impact exercise classes geared toward the population (e.g. African dance) and by employing African American health coaches and staff. Conversely, our findings could also be attributed to the format of the program. The HBFP offers low-impact group based exercise classes. Individuals in good health at baseline may not feel that these classes would be enough of a challenge. The class format may also keep larger numbers of men from joining the program. Men are more likely to participate in vigorous physical activity than women (41). Many men have stated they would like to see activities such as weight-lifting and basketball

offered by the program. The HBFP, however, was not designed for individual or vigorous physical activity. Also, younger, healthier individuals may also not be active members of the HBFP as they may not be able to attend scheduled classes due to work or other commitments. Lack of time has been cited as a barrier to physical activity (40, 48, 50).

While the overall active and top quartile active individuals were quite different compared with the non-active individuals, the bottom and top quartile active individuals were relatively similar to each other. This is unexpected, since one would anticipate that individuals who attended 214 exercise classes would be substantially different from those who only attended one exercise class. As previously stated, however, this finding may be due to the fact that we created and used an activity ratio rather than an attendance count in these analyses.

6.4 SPECIFIC AIM 3

Specific Aim 3: To determine the effect of having a family health history risk assessment with a genetic counseling student on activity level in African Americans.

Hypothesis: Previous work has shown that individuals who complete a family health history with a genetic counseling student are more likely to increase their level of self-reported physical activity (3). Based on this research, we hypothesized that individuals who completed a family history risk assessment and were told they were at moderate or high risk for cardiovascular disease, diabetes, and/or hypertension are more likely to be active than those who were told they are at average risk for these conditions. In addition, we hypothesized that there would be significant differences found between active and non-active individuals who completed a family history.

Outcome: Of 98 participants who completed a family history risk assessment with a genetic counseling student, 66 attended at least one exercise class (active group) and 32 never attended an exercise class (non-active group). Chi-square analysis revealed that individuals who completed a family history risk assessment were significantly more likely to be active ($p < 0.01$). Previous research indicated that individuals who completed a family health history session were more likely to increase their physical activity than individuals who did not complete a family history (3). This study provides further evidence for family history risk assessments leading to increased physical activity.

While the active and non-active groups did not differ in their objective risks for cardiovascular disease, hypertension, or diabetes, we did find a significant relationship between the timing of the family history session and activity status. Active individuals were significantly more likely to complete a family history in the three months after their fitness assessment ($p = 0.02$). The health coaches who work for the HBFP encourage all participants coming in for a fitness assessment to do their family health history, which may explain this finding. The family history session is also mentioned at the HBFP orientation sessions (before the fitness assessment), but one can speculate it is more likely that individuals would pursue a family history when told about the service in a one-on-one meeting with a health coach.

This study did not specifically identify why individuals who completed a family history session were more likely to be active participants in the HBFP exercise classes. Perhaps, individuals who are concerned about their family history are more motivated to participate in exercise and also more likely to complete a family history. Furthermore, past research by Vinaya Murthy, an alumna of the Genetic Counseling Program, indicated that individuals who complete a family history session become more accurate in their disease risk perception (51).

Analysis of risk perception in this sample was beyond the scope of this research; however, individuals who tend to underestimate their risk may become more active after completing a family history risk assessment.

6.5 LIMITATIONS OF THIS RESEARCH

This study had several limitations. First, this study was an analysis of retrospective data collected by the Healthy Black Family Project and therefore we did not design the baseline questionnaire. Unfortunately, the baseline survey that participants complete does not include questions about race/ethnic background. While we can safely say that greater than 98% of participants in this study are African American based on the report of HBFP staff who met with each participant individually at the time of their fitness assessment, we cannot report a more specific percentage and we cannot conjecture any information about the race of the other ~2% of participants in this sample. Additionally, the survey does not include questions about key demographic information that would give us a better understanding of the population being studied. Past research has consistently shown that SES (including income), occupational status, and level of education can explain some of the variation in activity level (40). Lower levels of education and lower socioeconomic status have negative relationships with physical activity. Marital status, another variable not addressed in the questionnaire, has been found to have a positive relationship with activity in African Americans specifically in several studies (39, 42). Those individuals who are married are more likely to be active. Ascertaining other information including number of children could also help to further explain a participant's activity level. Lack of time due to various obligations, including childcare, has been cited as a barrier and

found to have a negative relationship with physical activity (40, 48, 50). Moreover, the baseline questionnaire does not include questions addressing intrapersonal factors including psychological variables, questions regarding knowledge/attitudes/beliefs, and social variables. Factors in these categories have been shown to have strong associations with physical activity. Perceived self-efficacy is the most consistent predictor of physical activity (40). Also, the information analyzed from the baseline questionnaire is based on self-report. While the dependent variable for this research was objective, there was no way to verify that the independent variables (except the fitness assessment variables) were accurate. Finally, many of the independent variables were created by combining one or more questions from the baseline questionnaire. For example, a participant was considered “true” for “heart concerns” if he answered “yes” to at least 1 of 10 questions. Some of the questions were direct such as “Do you have a personal history of heart disease?” while others were trying to explore if a participant had an underlying undiagnosed heart concern with questions such as “Have you experienced rapid throbbing or fluttering of the heart?” Further research may focus on fewer questions from the questionnaire or when significant variables arise, the coded variable may then be broken down further to examine which of the questions specifically was causing the variable to be significant.

While this study had an adequate sample size for the analyses performed, there was a paucity of men included in this research. Due to the small number of men studied, it is hard to generalize our results to both genders, as these findings are probably explaining variance in activity levels and differences among various groups of African American women only. The predictors of physical activity may be different had the regression analyses been completed for men and women separately. Different variables may also be significant in the chi-square

analyses and t-testing. Unfortunately, this data set did not have enough men for separate analyses to be conducted.

This study also only looked at physical activity within the HBFP through program exercise attendance records. While this allows us to have an objective dependent variable for analysis and provides information about what defines active individuals in this program and similar group-based programs, it does not provide evidence for participants' physical activity efforts at home or work. In addition, we defined an active individual as anyone who attended at least one fitness class during the 18-month study period. The national recommendation for physical activity is defined as engaging in moderate physical activity (e.g. brisk walking, bicycling) for 30 minutes a day, 5 or more days a week or vigorous physical activity (e.g. running, aerobics, swimming) for 20 minutes a day, 3 or more days a week (31). Based on the information obtained for this study, we cannot define which participants in the active group are truly meeting the recommendations for physical activity.

In the subanalysis of individuals who completed a family health history with a genetic counseling student, we did not analyze the previous information gathered regarding participants' perceived risk for cardiovascular disease, hypertension, and diabetes, before and after the family history session, as it was beyond the scope of this research. Research by Vinaya Murthy, an alumna of the Genetic Counseling Program, showed that following a family health history session, participants' perceptions of risk for cardiovascular disease and colon cancer became more accurate (51). Therefore, those who tend to underestimate their risk may become more active after a family history session. This information may have given us more insight into why approximately twice as many individuals who did a family history tended to be in the active group.

Lastly, the statistics for the main analysis of this paper relied on the stepwise multiple linear regression technique. Regression is the statistical method most often used in determinant research. As with all prediction models it does not determine the mechanisms through which the different determinants or variables were operating. In fact, if additional variables were added to the model, we may get different significant predictors all together.

7.0 CONCLUSIONS

The first aim of this study was to determine whether baseline individual and family health factors predicted variation in physical activity levels among African Americans in community intervention programs. Results indicated some of the variation in activity level in the active group was, in fact, due to measurable differences in individual and family health factors. Overall, increased body fat percentage and decreased flexibility had a positive association with physical activity level in the active group. While decreased BMI also had a positive association with physical activity, when analyzed alone, it had little to no effect on variation in the active group. Additionally, family history of diabetes and personal history of cardiovascular concerns were significant predictors of activity among the most active (top quartile active) participants. Exercise is a dynamic process and many variables interact to affect an individual's activity level. Therefore, identifying factors that account for any of the variation in a measure like physical activity is remarkable.

While this study succeeded in identifying factors that account for a small amount of the variation in activity, future research should examine other predictors of activity in African American participants. Additional questions should be added to the baseline questionnaire to address the demographic and psychosocial variables mentioned previously. These variables have been found to play a large role in predicting physical activity in past studies and by adding these variables to the baseline questionnaire, we could better understand the population addressed by

this research. King et al. (1997) used several different scales to address psychosocial variables based on significant predictors from past research including the Perceived Stress Scale, the Beck Depression Inventory, the Taylor Manifest Anxiety scale (derived from the Minnesota Multiphasic Personality Inventory), the Energy/Fatigue subscale of the Medical Outcomes study, and the Interpersonal Support Evaluation List (30). While it would be time consuming for each participant to answer questions from all of these scales, the HBFP staff may have participants sign a consent form to complete the extended baseline survey beforehand. In this way, only participants who are interested in completing the survey would fill out the psychosocial portion, although, this may subsequently lead to bias in the data. For participants who consent to filling out the extended survey, it may also be worthwhile to attempt to recontact them at different time points and re-ask them certain questions from the survey to see how responses and determinants change over time. Additionally, further research could focus on participants who have completed more than one fitness assessment. Logistic regression could be used to analyze those who have improved one or more of their physical measurements (e.g. lowered their BMI, body fat, etc.) versus those who have not improved or stayed the same to see what defines “successful” participants.

The second specific aim of this study was to identify differences between the non-active and active groups, the non-active and most active (top quartile active) groups, and the least active (bottom quartile active) and most active (top quartile active) groups. Many significant differences were identified indicating that active individuals tended to have poorer health and be at greater risk for disease than non-active individuals. The least and most active individuals were very similar to one another. While the results of this study were meant to guide future tailoring

of exercise and program protocols, the findings indicate that the program is already tailored to reach and retain at-risk individuals.

Finally, the third aim of this study was to determine the effect of having a family history risk assessment with a genetic counseling student on activity level in African Americans. We found that those who completed a family history session were significantly more likely to be active participants ($p < 0.01$). In addition, significantly more individuals completed a family history after their baseline fitness assessment, likely due to the promotion of this service by the health coaches at the time of the initial assessment. Future research should aim to identify whether participants who completed a family history risk assessment were more active after their fitness assessment, after their family history session, or active to the same degree after both. The effect of risk perception on physical activity level in this group should also be explored.

In short, our results indicate that the HBFP is reaching at-risk individuals, not the “worried well”, which can be the case in some intervention programs. Despite the limitations of this study, the results provide valuable information about African Americans participating in physical exercise classes offered through community intervention programs similar to the HBFP. Specifically, the findings of this study are pertinent to Public Health professionals since both individual and population differences must be accounted for when implementing similar community intervention programs. The findings of this study are also important to Genetic Counselors, because it is vital to understand the factors that influence commonly recommended preventative behaviors like physical activity among this population. Moreover, this study emphasizes the importance of Genetic Counselors working in community-based settings.

APPENDIX A

INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL LETTER



University of Pittsburgh

Institutional Review Board

3500 Fifth Avenue
Ground Level
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)
<http://www.irb.pitt.edu>

Memorandum

TO: STEPHEN THOMAS, PhD

FROM: SUE BEERS, PhD, Vice Chair

DATE: 9/17/2007

IRB#: PRO07070242

SUBJECT: ASSESSING THE INFLUENCE OF THE FAMILY HEALTH HISTORY AND OTHER
FACTORS ON ACTIVITY LEVELS IN AFRICAN AMERICANS

The above-referenced project has been reviewed by the Institutional Review Board. Based on the information provided, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46.101(b)(4).

Please note the following information:

- If any modifications are made to this project, please contact the IRB Office to ensure it continues to meet the exempt category.
- Upon completion of your project, be sure to finalize the project by submitting a termination request.

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

APPENDIX B

FITNESS ASSESSMENT DATA COLLECTION SHEET

Fitness Assessment Data Collection

Assessment Data For: _____ Data ____/____/____

Enter your fitness testing measurements and observations below.

Initial Blood Pressure:

Systolic: _____ Diastolic: _____

Weight

Body Weight: _____ lbs/kg

Bioelectrical Impedance Body fat

Fat%: _____ and BMI: _____

Waist-Hip Ratio

Waist: _____ Hips: _____

Height

Height: _____ in / cm

3-Minute Step Test

Ending Heart Rate: _____ bpm

Sit-Reach Hip Flexion

Sit&Reach- Trial 1: _____ Trial 2: _____ Trial3: _____ Best of the 3 trials: _____

Modified Chair Stand

#Times Standing in 30 seconds: _____

Modified Chair Sit-Reach

First Trial: _____ in. Second Trial: _____ in. Best Trial: _____ in

Modified 8-Foot Up and Go

First Trial: _____ sec Second Trial: _____ sec Best Trial: _____ sec

Assessment Data Collection	10/17/2005
Prepared By: Healthy Black Family Project/ Kingsley Center/ Hosanna House	

APPENDIX C

HEALTHY BLACK FAMILY PROJECT BASELINE QUESTIONNAIRE



University of Pittsburgh

*Graduate School of Public Health
Center for Minority Health*

Office of the Director
125 Parran Hall
130 DeSoto Street
Pittsburgh, Pennsylvania 15261
Phone: 412-624-3555
Fax: 412-624-8679
URL: www.cmh.pitt.edu

Healthy Black Family Project Questionnaire

This information will help us to track your progress with our facility. Please answer each of these questions as accurately as you can. Should you have any questions, feel free to ask. Your responses will be treated in a confidential manner.

Today's Date: ____ / ____ / ____ Your Name: _____

Membership: Kingsley Center Hosanna House (Circle one)

Sex: Male Female (Circle one)

Date of Birth: ____ / ____ / ____

Address: _____

City: _____

Zip: _____ State: _____

Home Phone: _____ Day Ph: _____ Mobile: _____

Email Address: _____

Emergency Contact: _____ Phone: _____

Doctor: _____ Phone: _____



HBFP/Health Status Questionnaire

On this questionnaire, a number of questions regarding your physical health are to be answered. Please answer every question as accurately as possible so that a correct assessment can be made. Please place a check in the space to the left of the question to answer "Yes." Leave blank if your answer is "No." Please ask us if you have any questions. Your responses will be treated in a private and confidential manner.

Today's Date: ____ / ____ / ____ Your Name: _____

Medical Screening

- ☐ Do you have any personal history of heart disease (coronary or atherosclerotic disease)?
- ☐ Do you have any personal history of diabetes or other metabolic disease (thyroid, renal, liver)?
- ☐ Do you have any personal history of pulmonary disease, asthma, interstitial lung disease or cystic fibrosis?
- ☐ Have you experienced pain or discomfort in your chest apparently due to blood flow deficiency?
- ☐ Do you have any unaccustomed shortness of breath (perhaps during light exercise)?
- ☐ Have you had any problems with dizziness or fainting?
- ☐ Do you have difficulty breathing while standing or sudden breathing problems at night?
- ☐ Have you experienced a rapid throbbing or fluttering of the heart?
- ☐ Do you suffer from ankle edema (swelling of the ankles)?
- ☐ Have you experienced severe pain in leg muscles during walking?
- ☐ Do you have a known heart murmur?
- ☐ Has your serum cholesterol been measured at greater than 200 mg/dl?
- ☐ Are you a cigarette smoker?
- ☐ Has your HDL (the "good" cholesterol) been measured at greater than 60 mg/dl?
- ☐ Would you characterise your lifestyle as laid back, still, little to no exercise?
- ☐ Have you had a high fasting blood glucose level on 2 or more occasions (≥ 110 mg/dl)?
- ☐ Are you 20% or more overweight or have you been told your "BMI" was greater than 30?
- ☐ Have you been told your blood pressure was high on at least 2 occasions (systolic > 140 or diastolic > 90)?
- ☐ Do you have any family history of heart disease prior to age 55?

Medical History - Detail

☐ Are you currently being treated for high blood pressure?

If you know your average blood pressure, please enter: _____ / _____

Please check all conditions or diagnoses that apply: _____

- | | | |
|---|--|---|
| <input type="checkbox"/> Abnormal EKG? | <input type="checkbox"/> Limited Range of Motion | <input type="checkbox"/> Stroke |
| <input type="checkbox"/> Abnormal Chest X-Ray | <input type="checkbox"/> Arthritis | <input type="checkbox"/> Epilepsy or Seizures |
| <input type="checkbox"/> Rheumatic Fever | <input type="checkbox"/> Bursitis | <input type="checkbox"/> Chronic Headaches or Migraines |
| <input type="checkbox"/> Low Blood Pressure | <input type="checkbox"/> Swollen or Painful Joints | <input type="checkbox"/> Persistent Fatigue |
| <input type="checkbox"/> Asthma | <input type="checkbox"/> Foot Problems | <input type="checkbox"/> Stomach Problems |
| <input type="checkbox"/> Bronchitis | <input type="checkbox"/> Knee Problems | <input type="checkbox"/> Hernia |
| <input type="checkbox"/> Emphysema | <input type="checkbox"/> Back Problems | <input type="checkbox"/> Anemia |
| <input type="checkbox"/> Other Lung Problems | <input type="checkbox"/> Shoulder Problems | <input type="checkbox"/> Are You Pregnant? |
| | <input type="checkbox"/> Recently Broken Bones | |

☐ Has a doctor told you to avoid any activities? If so, please describe:

Family History

Have your mother, father, or siblings suffered from any of the follow (please select all that apply):

- | | |
|---|---|
| <input type="checkbox"/> Heart attack or surgery before age 55 | <input type="checkbox"/> High cholesterol |
| <input type="checkbox"/> Stroke before age 50 | <input type="checkbox"/> Diabetes |
| <input type="checkbox"/> Congenital heart disease or left ventricular hypertrophy | <input type="checkbox"/> Obesity |
| <input type="checkbox"/> Hypertension (high blood pressure) | <input type="checkbox"/> Asthma |
| <input type="checkbox"/> Leukemia or cancer before age 60 | <input type="checkbox"/> Osteoporosis |

Medications

Please list the specific medications that you currently take:

Lifestyle

- ☐ Are you a cigarette smoker? If so, how many per day? _____
- ☐ Previously a cigarette smoker? If so, when did you quit? _____
- How many years have you smoked or did you smoke before quitting? _____
- Do you/did you smoke (Circle one): Cigarettes Cigars Pipe

Please rate your daily stress levels (select one):

- ☐ Low ☐ Moderate ☐ High : I enjoy the challenge ☐ High: sometimes difficult to handle ☐ High: often difficult to handle.

Please describe your eating habits (select all that apply)

- ☐ I seldom consume red or high-fat meats. ☐ I eat at least 5 servings of fruits/vegetables per day.
- ☐ I try to do a low-fat diet. ☐ I almost always eat a full, healthy breakfast.
- ☐ My diet includes many high-fiber foods. ☐ I rarely eat high-sugar or high-fat desserts.

Other

Please indicate any other medical conditions or activity restrictions that you may have. It is important that this information be as accurate and complete as possible

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